

Rock Products

Vol. XXIII, No. 19 September 11, 1920

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Nathan C. Rockwood.....Editor
Chas. A. Breskin.....Assistant Editor

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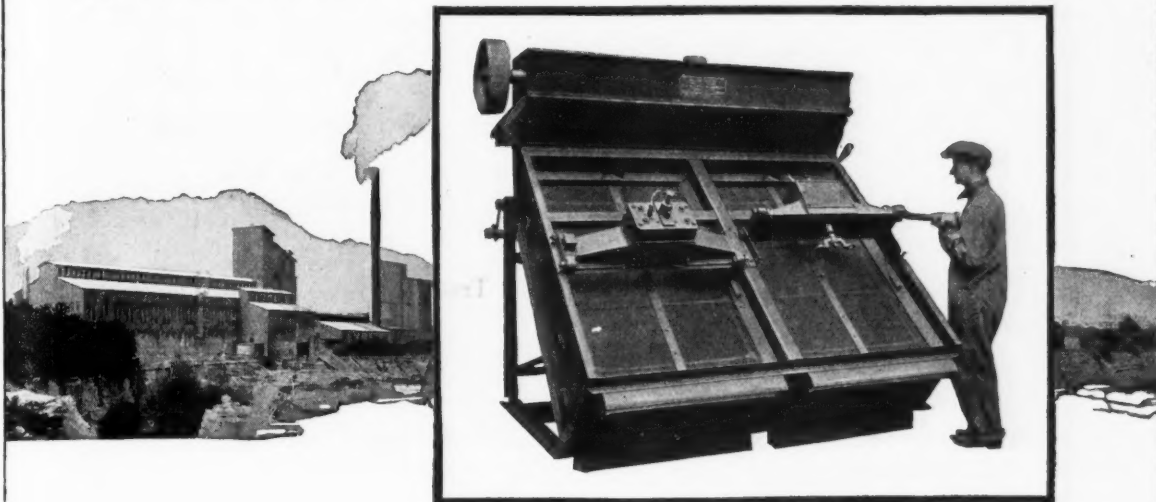
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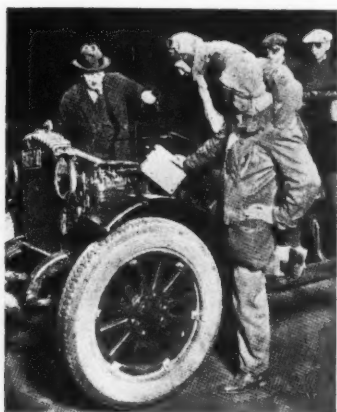
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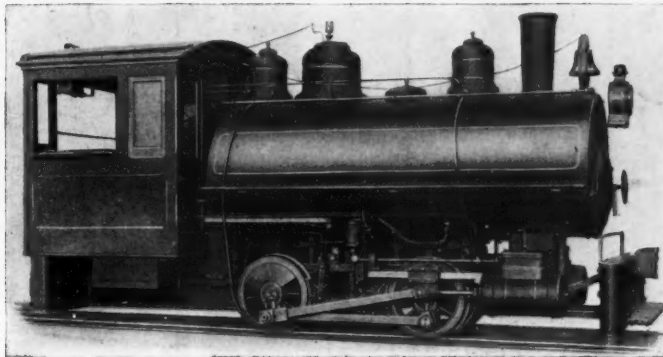
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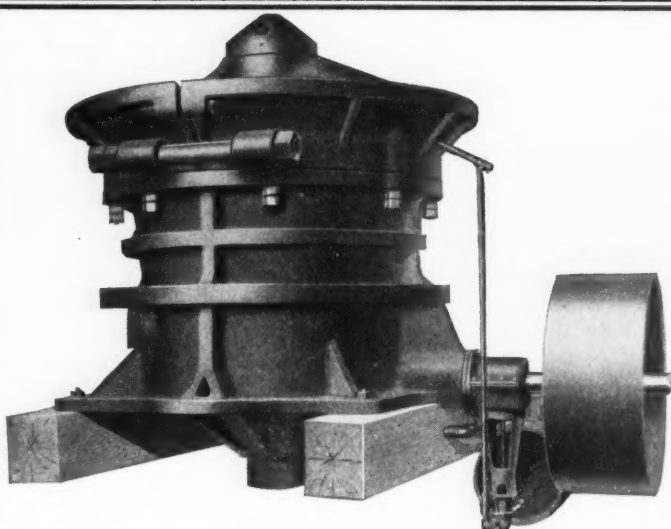
We are prepared to build locomotives for any kind of service and for the most difficult operating conditions. Our Record No. 86 describes steam locomotives for Industrial and Contractors' Service, and Record No. 95 illustrates Internal Combustion Locomotives.

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LOCOMOTIVES

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Is Tel-smith's central shaft really unbreakable?

Is Tel-smith's parallel stroke particularly effective in gripping big rock, as claimed by the manufacturers?

Are Tel-smith eccentric bearings as large as claimed and do they stand up?

Is Tel-smith's capacity satisfactory? Is the power consumption as low as claimed?

If you have not made a first-hand study of Tel-smith pillar-shaft crusher, you will be surprised at the replies received.

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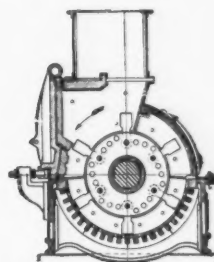
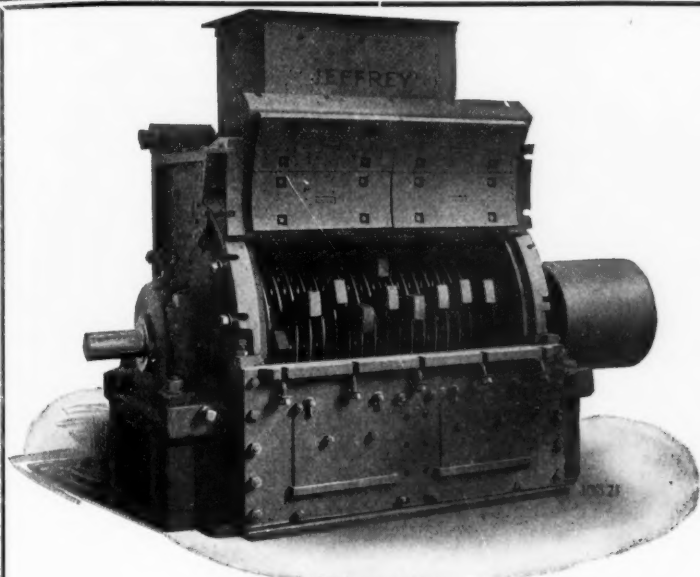
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Sectional View of Pulverizer Showing Top Feed

Note: Accessibility, Compactness and Ball Bearings

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for Breakdown of Large Pieces of
Limestone, Gypsum, Shale, etc.

Leading Cement Mills, Lime Plants, Quarries, Gypsum Plants, etc., are being equipped with Jeffrey Swing Hammer Pulverizers to meet the constantly increasing demands.

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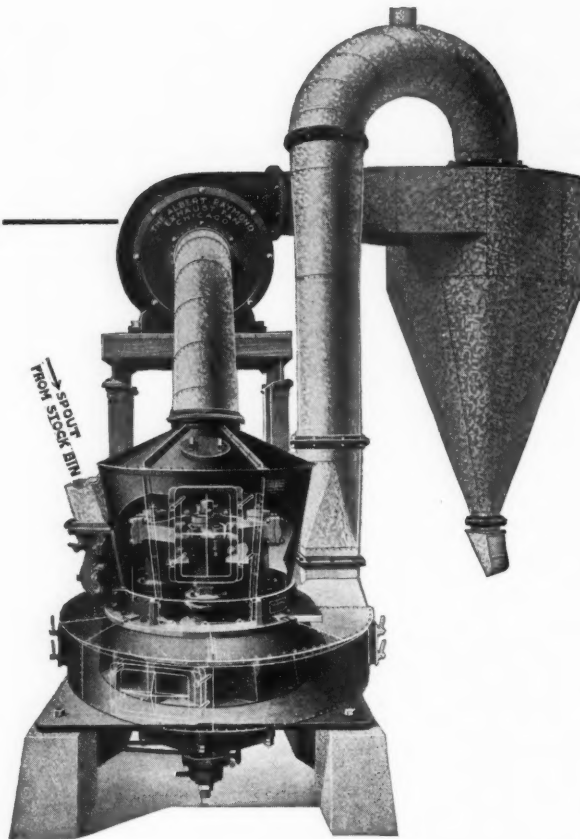
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"We have made a 30-day test on extreme fine pulverizing of our coal to determine the advantages in pulverizing to a fineness of 92% passing a 200-mesh sieve, 82% passing 300 and less than $\frac{1}{2}$ of 1% residue on the 100 mesh sieve. We made a saving of 14 pounds

of coal per barrel of cement manufactured. With an output of 4 tons per hour per mill with 85 H.P. consumed on fan and mill, the fineness tests for 300 successive hours do not vary over 4 points of one per cent either way at any one of the 300 sievings."

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Start a small plant of this kind—the expense is small and it will not require much work to introduce the product.

“Crescent” Foot Lever Tamping Brick Machines have a capacity of from 5,000 to 6,000 brick a day.

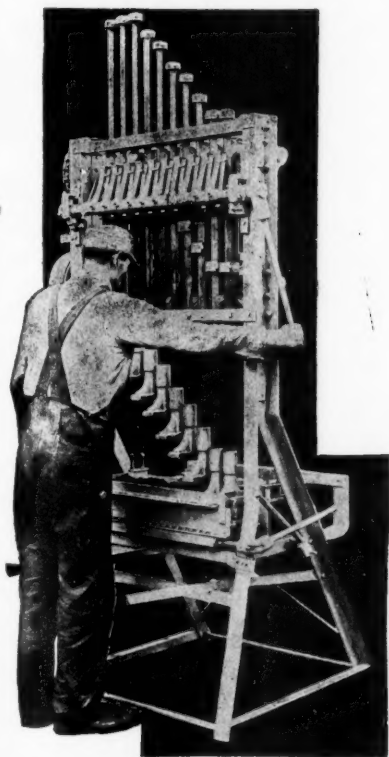
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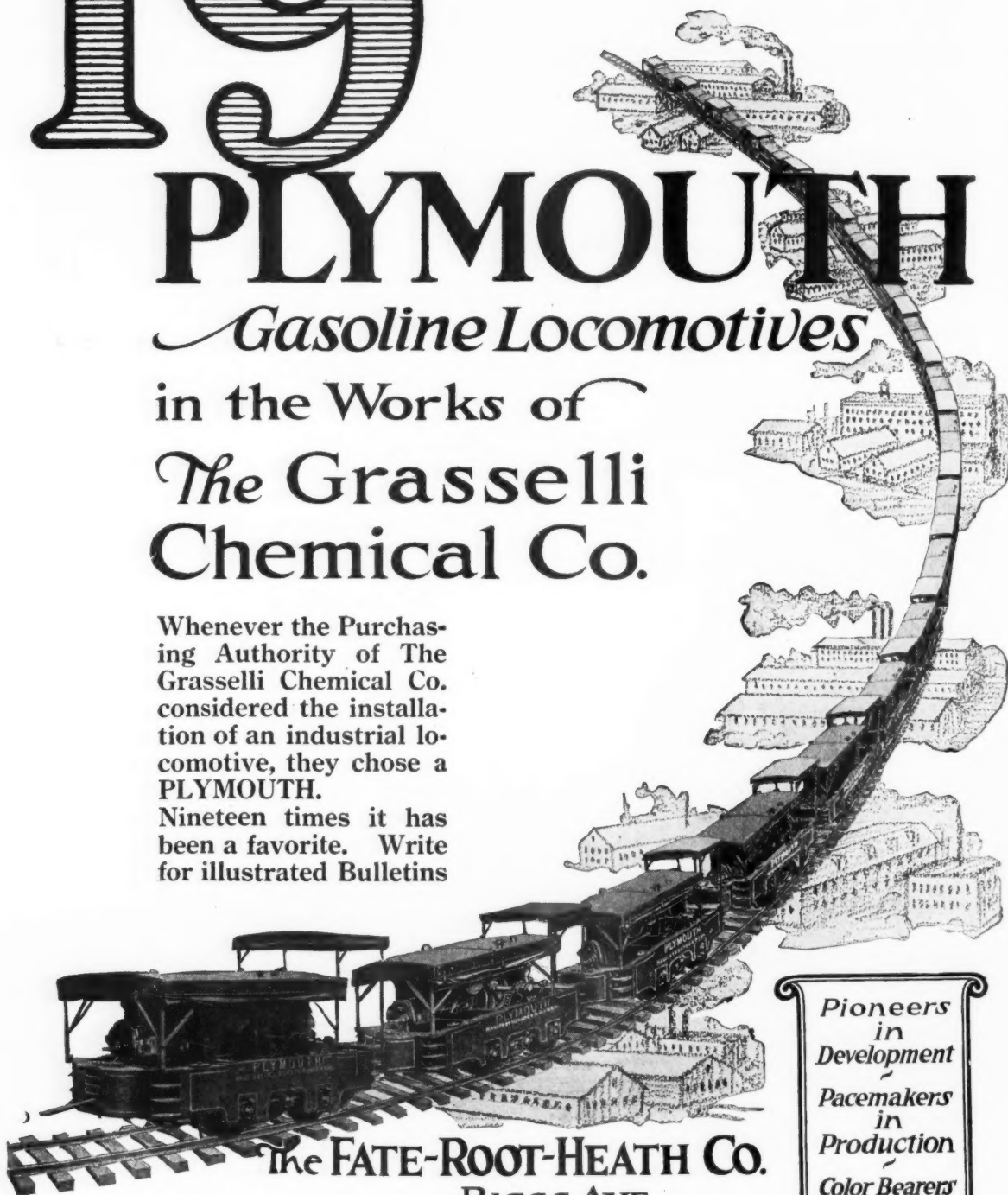
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Realizing that no one machine or type is the best for all work, and knowing the limitations of each device, it is the policy of the STURTEVANT MILL COMPANY to recommend the machine best suited for the purpose, regardless of its maker or competition with its own equipment. Never will it attempt a contract or supply a machine unless to its best knowledge and belief it can fulfill the requirements satisfactorily. A broad, unselfish policy based on the principle that service means satisfied customers.

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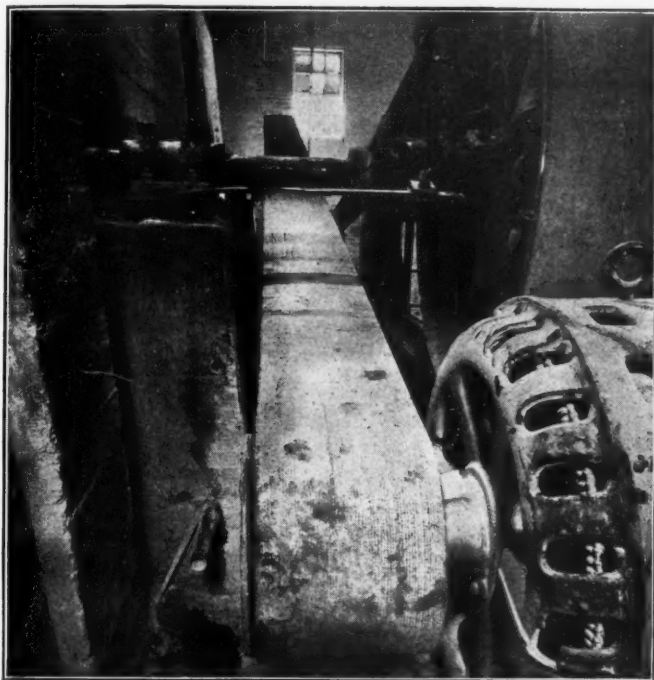


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What is the Cost of Excessive Stretch

AT the time of installing this Anaconda belt, a 16" heavy double leather belt was placed on a similar drive in the same plant.

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Both belts started operation at the same time.

Both belts were of the same size, and considered of equivalent rating.

And both belts transmitted equal power to the same kind of machinery—silica pulverizers.

But here the parallel ended.

The first cost of the leather belt was nearly twice that of the Anaconda.

And it stretched during the period of observation 64" to the Anaconda's 4".

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Insurance against power losses and deterioration, both due to stretch and slippage.

And it means a saving in time and labor for avoidable belt repairs—if not for actual shut downs—with a corresponding lowering of operating costs.

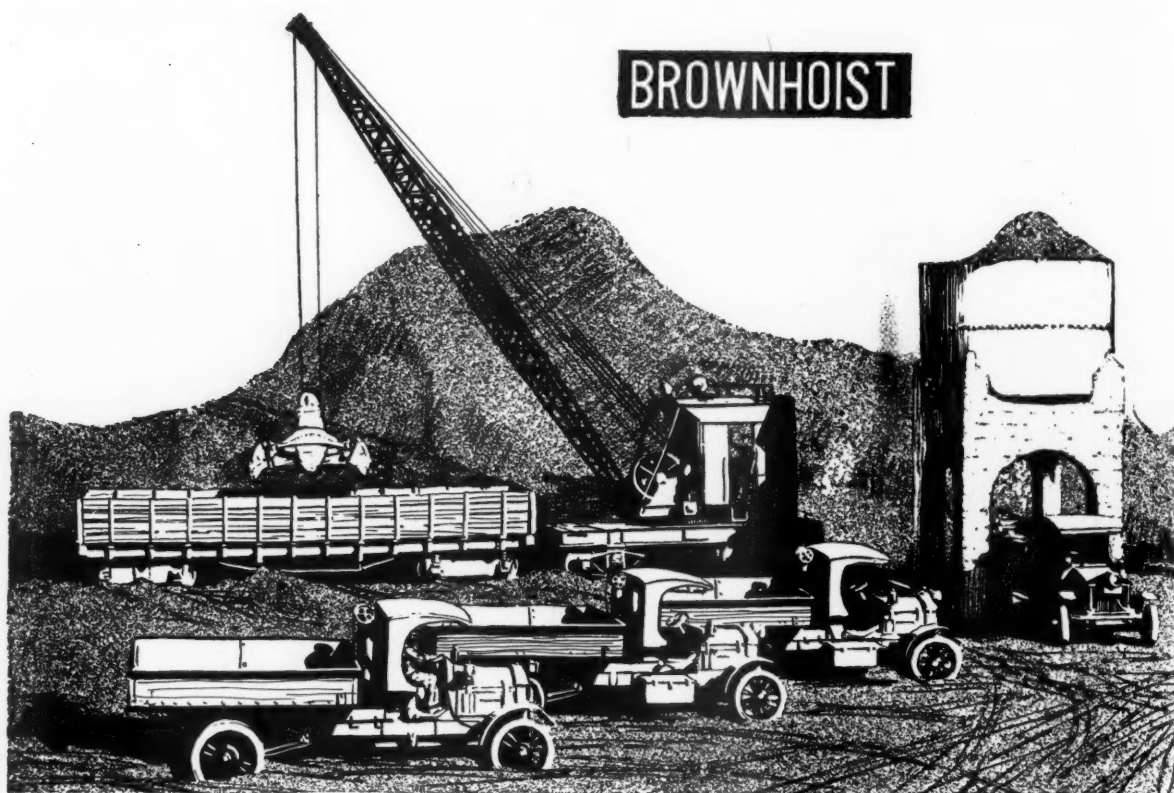


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Get Materials on the Job on Time

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The ideal answer to this problem is a storage yard for materials with suitable handling equipment to place them in and out of storage. Materials can then be bought when the market is right and are on hand when you want them. And there is no hold-up on the job because you cannot get material and have it delivered when you need it. For such a storage yard, the Brownhoist locomotive crane is the ideal handling unit.

Many contractors count the Brownhoist their most useful and dependable machine. The Brownhoist makes a storage yard practicable, it does away with waits for your trucks and it switches your cars of materials when and where they are needed. In short, it is a money-maker that you should not overlook if your work includes the handling of miscellaneous building materials. May we send you Catalog K on Brownhoist locomotive cranes?

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Products include:

Locomotive Cranes
Grab Buckets
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"AMERICAN" Hoisting Engines Produce More Power

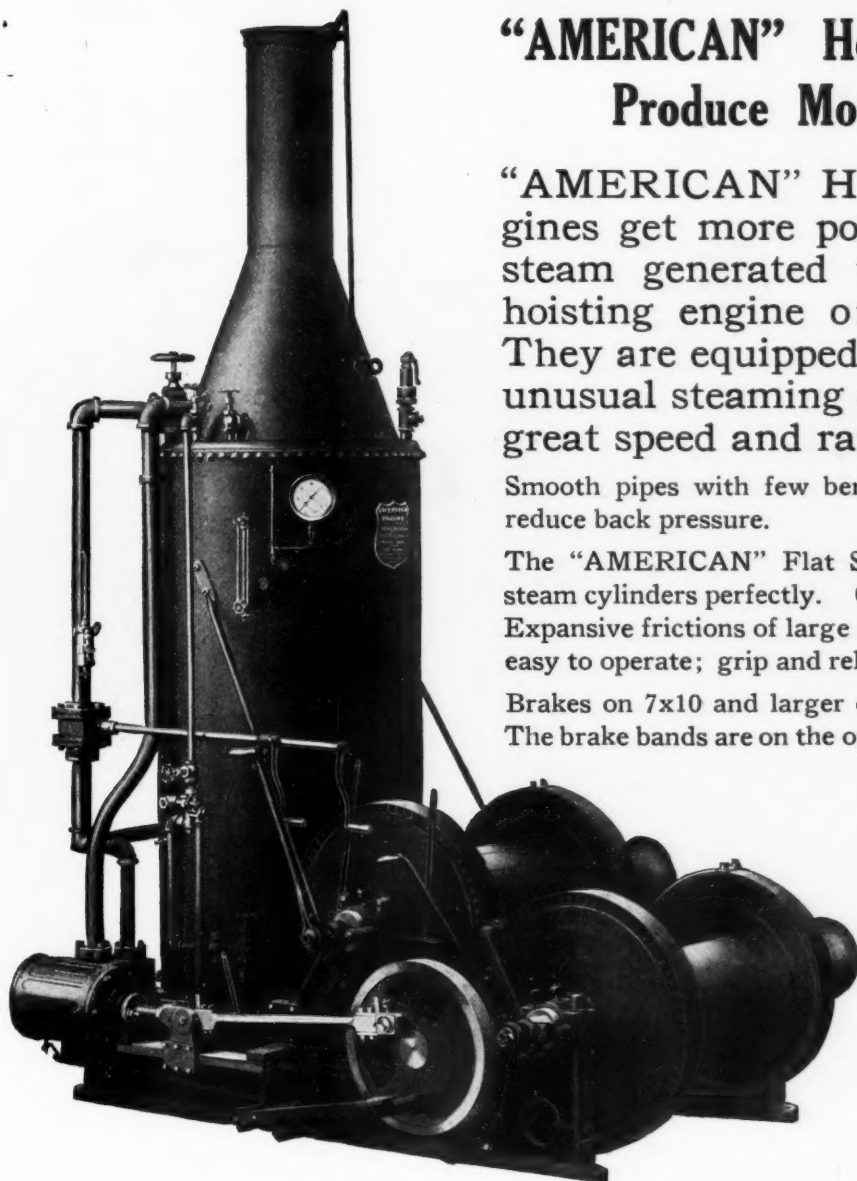
"AMERICAN" HOISTING Engines get more power out of the steam generated than any other hoisting engine on the market. They are equipped with boilers of unusual steaming capacity. Insure great speed and range.

Smooth pipes with few bends conserve power and reduce back pressure.

The "AMERICAN" Flat Seated Throttle controls steam cylinders perfectly. Grinds itself, never leaks. Expansive frictions of large diameter, cool running; easy to operate; grip and release smoothly.

Brakes on 7x10 and larger engines are dredge type. The brake bands are on the opposite end of drum from the frictions. This reduces any tendency to heat in fast work.

No matter where you are an "AMERICAN" representative can reach you in twenty-four hours.



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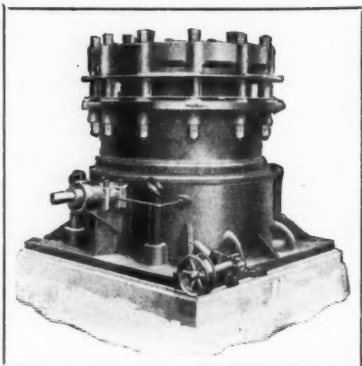
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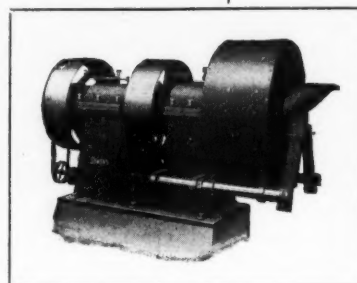


Symons Vertical Disc Crusher

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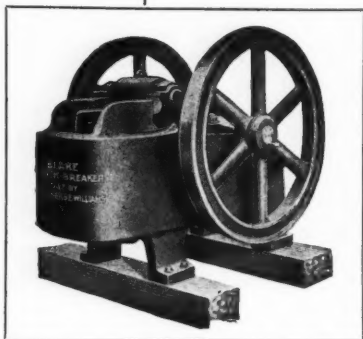
The Symons Disc Crusher

An improved type with revolving manganese discs which combine a rocking movement to prevent "packing" trouble when small sizes are crushed.



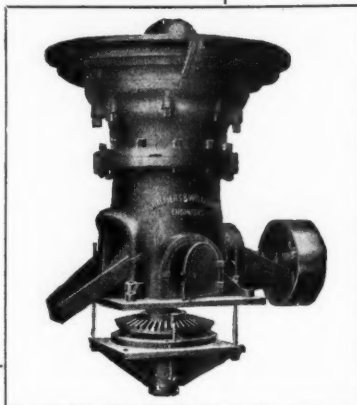
The Blake Rock Breaker

A sturdy design with minimum number of wearing parts. The crushing plates can be reversed and re-used.



Bronze Ball Gyratory Crusher

A machine having a ball and socket seat for the main shaft to give a large bearing surface and to reduce re-babbiting to a minimum.



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A uniformly loaded truck like this, means easier handling, with less vibration and wear. Many shrewd Supply Dealers have lowered their hauling costs, by taking full advantage of Packard's ability to carry 85% to 95% of live load on the rear axle, in this way

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TODAY the truck owner has a choice of two methods when selecting his trucking equipment.

Either he can buy his truck by "rule of thumb," trusting to luck that it will meet his requirements—or he can go to transportation experts who will select the right truck for his individual job.

The Packard engineers represent transportation authority. An authority backed by years of trucking experience, and over 9,000 monthly operating records, of trucks in all lines of business.

They can assure the truck owner not only a saving in hauling costs but a truck fitted to the actual work it has to do.

Each size of Packard Truck is designed as a unit around its engine as a basis.

Rear-end, clutch, gears—each size the proper design for its own engine.

Packard unity of design overcoming that common difficulty—an engine too big for

the rear-end; or driving mechanism too heavy for the engine.

Another reason why Packard Trucks handle loads more economically per hundred pounds of truck.

Packard engineering considers operating economy more vital than cheapening production in the factory.

Low transportation costs shown by Packard Trucks—dependable performance—long life—all matters of record.

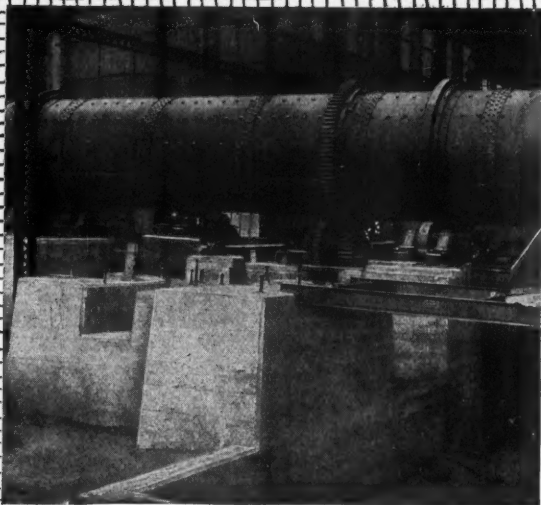
These records and the Packard's 44 definite factors of superiority (details available at local Packard headquarters) will keenly interest the truck owner.

They will give him a positive idea of how Packard's transportation experts have helped men in all lines of business increase their profits by reducing their trucking costs.

We have prepared an interesting booklet on motor hauling of coal. Sent on request by nearest Packard Distributor.

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can be produced
economically
with

VULCAN ROTARY KILNS

The production of soda ash is not only facilitated by the use of Rotary Kilns, but it can be manufactured in quantity at a lower cost.

VULCAN Rotary Kilns have long been identified in this industry with low labor cost of operation, minimum maintenance outlay and quantity and quality production.

This is but one of sixty-five processes in which Rotary Kilns offer an outlet to economical output and operation.

Your inquiries will receive prompt attention

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Designers and Builders of Rotary Kilns for 26 years

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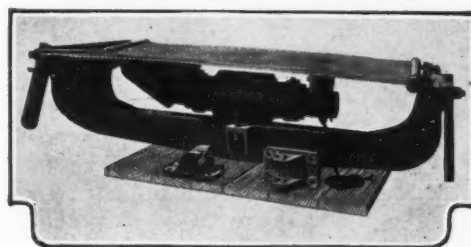
Manufacturers of

It is just as important that the manufacturer of a piece of machinery be dependable as it is that the machine itself be efficient. For during the entire life of the machine, occasions will arise time and again requiring the right kind of co-operation on the part of the manufacturer to keep it at maximum efficiency.

Consider this point in relation to the Mitchell Electric Vibrating Screen:

The Mitchell is manufactured by the Stimpson Equipment Company one of the largest concerns of its kind in the intermountain west; manufacturer also of the Janney Flotation Machines, for the concentration of ores amenable to flotation; sales representative for the Worthington Company and distributor of standard mining and milling machinery of all kinds. The scope of this company's operations is nation wide.

MITCHELL ELECTRIC VIBRATING SCREEN



The electric vibrator, the distinctive feature of the Mitchell Electric Vibrating Screen, is manufactured by the GENERAL ELECTRIC and WESTINGHOUSE—two names that convey more than a sufficient guarantee of dependable workmanship

To insure a proper installation and operation of Mitchell Electric Vibrating Screens we have organized a special Service Department, in charge of one of the country's foremost screen experts. He is in close touch with every installation and is prepared to make a personal visit to any plant where it is deemed advisable.

You may be certain that the Mitchell will give you unparalleled efficiency in screening and that behind each installation of it stands the Stimpson Equipment Company ready with the fullest co-operation to insure maximum service.

STIMPSON EQUIPMENT COMPANY
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FIRST in the Development of Lower-Strength Explosives

A VERY great and very fine work has been done by the technical experts and field representatives of this Company. They have produced and adapted to various industries lower-strength powders that do the same work as those of higher strength at a considerable saving.

A striking example is a saving of \$15,000 per year effected for one large operator (name on request) by a Du Pont field man who successfully substituted 30% dynamite for the 40% dynamite formerly used.

Every 10% reduction below 40% means a saving of \$1.25 to \$1.50 per hundred weight. By recommending lower-strength powders to our customers we were able to save them over \$1,000,000 during the year 1919.

Whatever the strength, it goes without saying that Du Pont Explosives are *uniformly* of the highest quality that can be produced.

E. I. du Pont de Nemours & Co., Inc.

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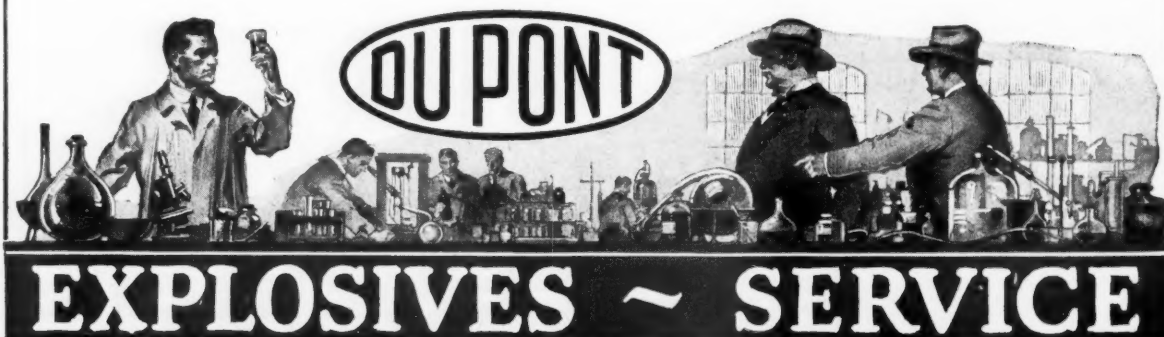
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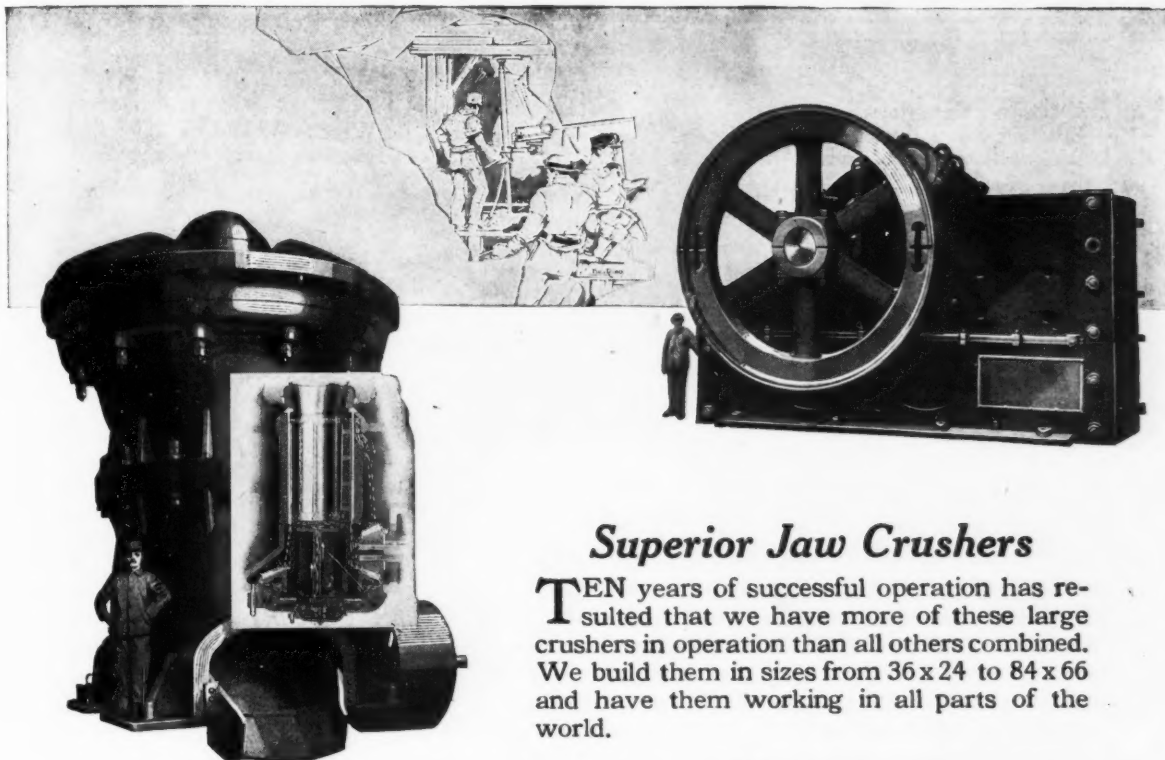
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WORTHINGTON ROCK CRUSHING MACHINERY



Superior Jaw Crushers

TEN years of successful operation has resulted that we have more of these large crushers in operation than all others combined. We build them in sizes from 36 x 24 to 84 x 66 and have them working in all parts of the world.

Superior McCully Gyratory

SEVEN years of successful operation and over 300 installations in operation on Lime Stone, Trap Rock and hard Iron Ore, prove this machine a good buy. It embodies patented construction features and is built in sizes from 8" to 50" opening.

Both Superior McCully and Superior Jaw Crusher are the original machines of their type and are built at our great Power and Mining works at Cudahy, Wis.

WORTHINGTON PUMP AND MACHINERY CORPORATION

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See Our Exhibit at the
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Chemical Industries
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Gyratory Crushers, Jaw Crushers,
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To further enlarge their service,
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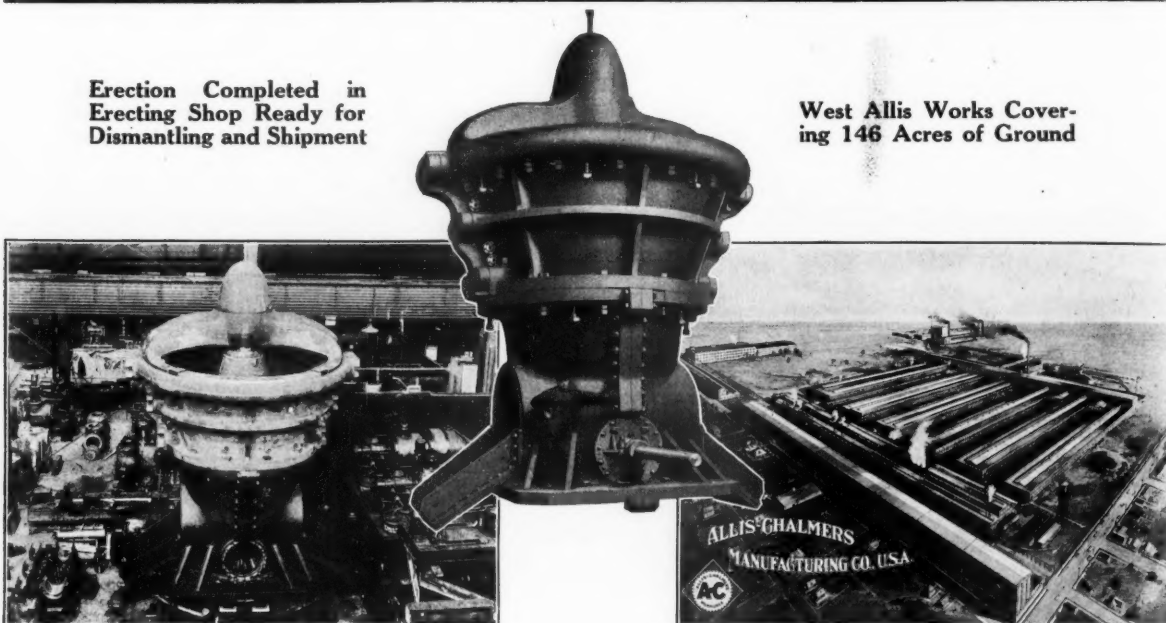
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Building Two Great Crushers

Erection Completed in
Erecting Shop Ready for
Dismantling and Shipment

West Allis Works Cover-
ing 146 Acres of Ground



This is the final advertisement of a series of "Progress Photographs" taken during the construction of the two

Largest Crushers Ever Built by This Company for One of the Largest Copper Mining Companies in the World

The last illustration appeared in the Aug. 14th issue of this publication.

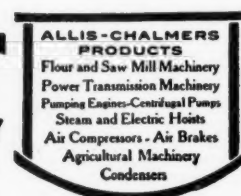
The crusher shown is assembled complete in the Erecting Shop of our West Allis Plant.

Our policy always has been to adhere to high grade workmanship and materials in every detail. In the construction of these two large crushers, therefore, no slipshod methods were used to unduly hasten either the design or workmanship at the expense of accuracy.

This policy has been the underlying reason for the successful operation of over 7,000 Gates Gyratory Breakers built by this Company and shipped to all parts of the world for crushing the toughest rock under the most difficult operating conditions.

We invite you to visit our West Allis Works when in Milwaukee to get an adequate idea of the size of the plant, and of its modern equipment.

Our literature on crushing and cement machinery will be gladly furnished on request.



District Offices in All Leading Cities

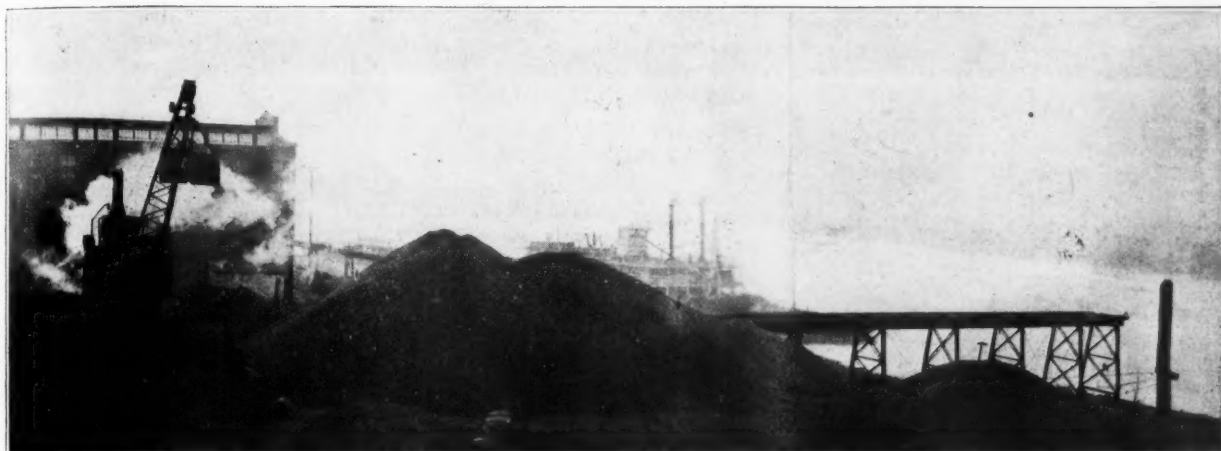
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Rock Products

Vol. XXIII

Chicago, September 11, 1920

No. 19



Sand and gravel operation of the Bible Sand Co., Chattanooga, Tenn.

Tennessee River Gravel Operation

Ladder Dredges With Washing, Screening and Crushing Plants—Bible Sand Company of Chattanooga

ALMOST ALL of the sand and gravel used in the Chattanooga, Tenn., district comes from the Tennessee River, and the Bible Sand Co., a subsidiary of the Dixie Portland Cement Co., is the most active river operator. This company operates three diggers, 19 barges and two unloading yards in the city. The material is sold both to the retail trade by the truck load and to contractors and builders in car-load lots.

The illustrations included in this article are of the largest of the three diggers.

This is the usual ladder type of dredge, such as is found in the Ohio River sand and gravel operations.

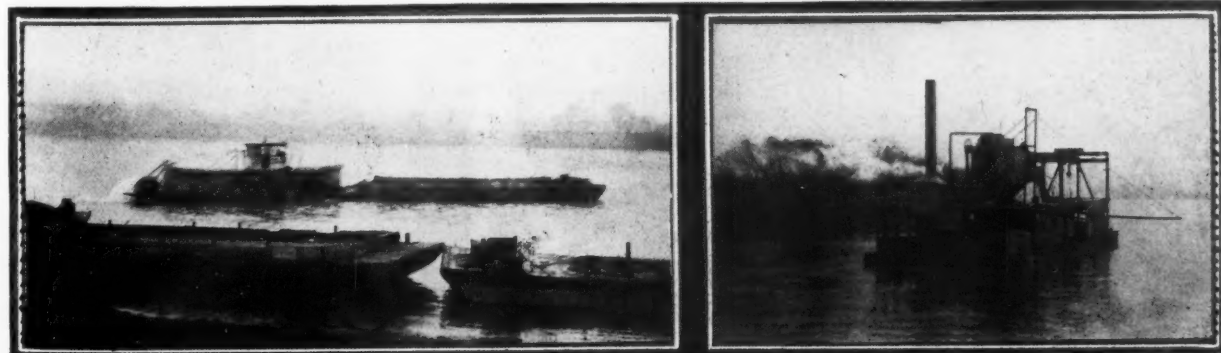
The bucket excavator is in the middle of the boat and extends out beyond the hull so that the boat can be pushed into a bank deposit. Two deck winches are provided to raise or lower the bucket ladder while at work. The normal digging depth is 25 ft. This machine is suited to operate only in loose sand and gravel as would be found in under water

deposits. The buckets each have a capacity of 2 cu. ft.

The hull draws about 6 ft. of water. The dredge is anchored to the shore by guy lines, which are also used as tow lines to pull the boat farther up into the deposit as it is excavated. This machine will excavate 600 cu. yd. of material per 10-hour day.

The main power unit of the dredge is a reciprocating steam engine which drives the bucket chain.

The buckets dump into a horizontal washing or mixing box, where water from a



Types of barges and dredge used in Tennessee River sand and gravel operation

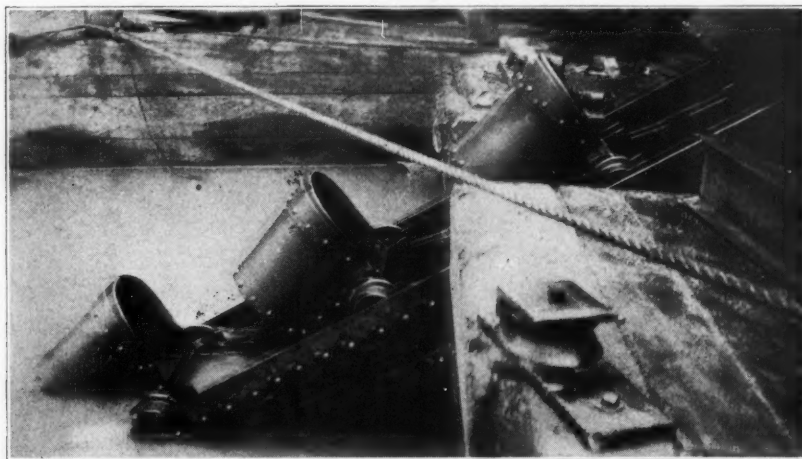
5-in. pipe is added. This box is rectangular in shape and is elevated so that the gravel and water mixture is chuted or flumed from it into a double-jacked revolving screen. The screen and the two jackets produce

two sizes of gravel and one of sand.

A 10-in. gyratory crusher has recently been added to the dredge's equipment to receive and reduce all stone and gravel over 2 in. in size, which is rejected by the screen.

One of the accompanying views shows the crusher setting and the bucket elevator which returns the crusher output to the sizing screen.

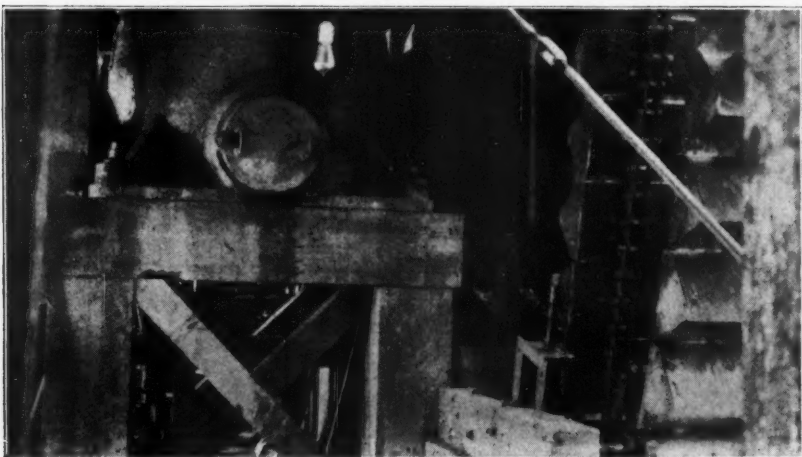
Each size of material produced is loaded



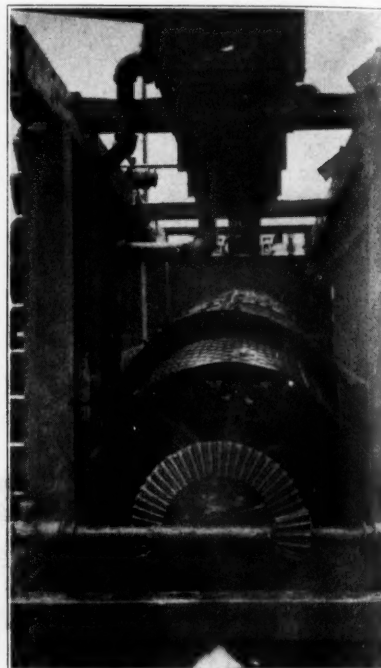
Bucket well and dredge buckets



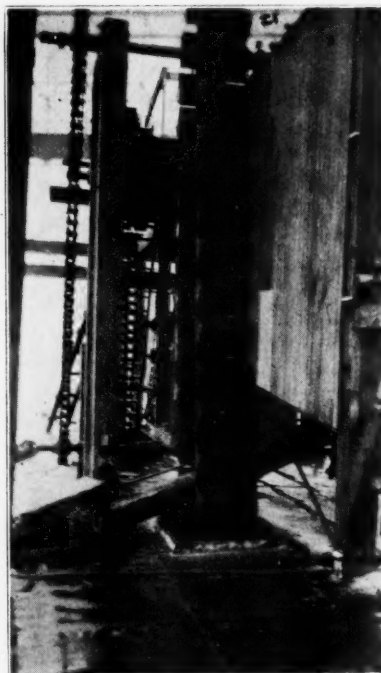
Another view of buckets showing ladder



Crusher mounted on dredge



Screen and feeder



Elevator from crusher

Some details of a Tennessee River sand and gravel dredge

into barges alongside as fast as it is produced. Eleven 70-cu. yd. barges and eight 125-cu. yd. barges are used to transport the material to the Chattanooga city yards.

The company owns two yards which are identical in layout except that the traveling crane at one is operated by steam and at the other by electricity. The latter is at the new yard, which has only been in operation about two years.

The yard equipment in each case consists of a 10-ton locomotive crane, equipped with a clamshell bucket, and a small hopper to load trucks. The view on the first page gives a good idea of the yard layout. The crane, which is mounted on a wide gauge track, runs out to the water's edge and dips out a bucket full of material and carries it 125 ft. to the truck-loading chute, or dumps it direct into the railway cars.

Both sides of the track for the 125 ft. are used for ground storage, and the crane unloads the barges to this storage when there are no cars to be loaded or trucks for the retail trade.

Ample storage space is secured along the sides of the track and the dredging plants are idle only about 30 days during the winter. Each of the yards is capable of handling about 450 cu. yd. of material per day.

Since this plant is owned by the Dixie Portland Cement Co., whose plant is at Richards City, Tenn., the management is able to co-ordinate the two industries each for the good of the other. The Bible Sand Co. has the same officers as the cement company, namely, Richard Hardy, president; Wellington Barnes, treasurer; George Kilian, secretary, and J. H. Dalbey, sales manager.

Indiana Sand-Gravel Men Pursue Policy of Knowing Material

Have Established the First Strictly Sand and Gravel Laboratory in America

IT WILL BE RECALLED by observant readers of ROCK PRODUCTS that several months ago, at its annual meeting in Indianapolis, the Indiana Sand and Gravel Producers Association definitely decided that the successful sand and gravel operator was the one who knew most about the material he produced; and could teach engineers and contractors how to use it to the best advantage, instead of being dictated to by engineers as to what he *must* produce under any and all circumstances, whether his operations were suitable to such specifications or not.

A bulletin of the Association states:

"Recent experience with the technical requirements of sand and gravel specifications for making concrete demands a declaration of principles as follows:

"(1) That specifications for sand and gravel for use in concrete construction be drawn so as to fully preserve the favorable and natural characteristics of these materials and the economies of their production.

"(2) That in order to fulfill the foregoing policy, the division between the coarse and fine aggregate so far as sand and gravel are concerned be determined by the conditions surrounding the production and the sale of these materials.

"The plans of the specification committee for study and investigation to secure the adoption of the above principles were approved in full. Full co-operation of the state highway engineers has been secured in this work."

Tabulated tests of Indiana sand for concrete roads made by Purdue University for the Indiana State Highway Commission 1919, show interesting facts in regard to the sizing of particles of sand. The twelve sands tested were acceptable for state highway work under the 1919 specifications. All except one were 30 per cent or more stronger than the standard Ottawa, and that one was very little below standard Ottawa—not enough to cause its rejection. The significant fact in regard to this one sand was its grading. It was the only sample in which more than 50 per cent was finer than No. 30 sieve. All of the other sands had 50 per cent or more coarser than No. 30. The strongest sand tested had 94.3 per cent coarser than No. 30 sieve. The new State Highway

specification requiring that 50 per cent be retained on No. 30 sieve is based on these tests.

Concrete Lawn

THE CONCRETE "LAWN" has at last made its appearance in front of a Los Angeles bungalow. The inventor says it saves time, money, and worry. It never has to be cut, is always dry to sit on, and it needs painting only once a year. One of the biggest advantages is that it is never full of dandelions.

Check on Fineness Tests of Cement

AN INTERESTING TEST has just been completed by the United States Bureau of Standards in co-operation with several other laboratories which indicates how closely the results of careful work along certain lines may be expected to check. A sample of cement was sent by the Atlas Portland Cement Co. to the Bureau and to several other laboratories with a request for a 200-mesh sieve determination in order that the results as obtained by the different laboratories might be compared. The work was completed and the conclusions forwarded to the Atlas company. It was found that all the results were within 0.3 of 1%.

Sand and Gravel in 1919

APPROXIMATELY 60,196,000 short tons of sand and gravel of all grades was sold in the United States in 1919, according to preliminary estimates made by L. M. Beach, of the United States Geological Survey, Department of the Interior. This quantity represents a decrease below that sold in 1918 of about 1,628,000 tons. The value in 1919, however, was \$37,819,000, as compared with \$37,927,079 in 1918, which shows that the average price had increased.

Producers report that the demand for this material in 1919 was heavy but that the production was curtailed on account of car shortage.

Sand and gravel produced in the United States, 1915-1919.

Year.	Glass sand.		Molding sand.		Building sand.	
	Quantity (short tons).	Value.	Quantity (short tons).	Value.	Quantity (short tons).	Value.
1915.....	1,884,044	\$1,606,640	3,585,746	\$2,123,203	22,921,426	\$6,884,267
1916.....	2,018,317	1,957,797	4,662,649	3,219,839	27,193,462	8,569,675
1917.....	1,942,675	2,685,014	4,660,968	4,303,809	25,374,967	9,837,688
1918.....	2,172,887	4,209,728	4,910,178	5,121,865	19,686,885	9,772,556
1919.....	1,690,000	3,090,000	3,715,000	3,510,000	17,597,000	9,778,000

Year.	Other sand.		Gravel.		Total.	
	Quantity (short tons).	Value.	Quantity (short tons).	Value.	Quantity (short tons).	Value.
1915.....	7,550,773	\$2,558,901	40,661,314	\$9,948,546	76,603,303	\$23,121,617
1916.....	9,089,550	3,942,538	46,127,754	12,229,146	89,061,732	29,509,996
1917.....	8,666,876	4,982,232	35,573,819	13,508,199	76,419,325	35,296,902
1918.....	6,349,870	5,259,620	28,704,006	13,563,310	61,824,426	37,927,079
1919.....	6,940,000	5,076,000	30,254,000	16,365,000	60,196,000	37,819,000

* Figures for 1919 are preliminary and subject to revision.

Overcoming Feeding Difficulty of Large Gravel Plant

Boulders in Gravel Deposit of Chicago Gravel Company at Rockdale, Illinois, Necessitates the Use of a Grizzly Feeder

THE CHICAGO GRAVEL CO., Chicago, Ill., operates a plant at Rockdale, Ill., that has the distinction of being the first sand and gravel plant in the world to be equipped with a grizzly feeder for its initial crusher.

Gravel Deposit

The gravel deposits at Rockdale are of a peculiar nature. The gravel bank is in the shape of a bluff, a mile and three-quarters long and rising above the surrounding valley to an average height of 65 ft. The deposit contained so many boulders that the gravel development really became a boulder crushing proposition. The boulders, however, are the most valuable product of the deposit, which runs 75 per cent gravel to 25 per cent torpedo sand.

Old Crushing Unit

Before the installation of the new grizzly feeder, the material was dumped

from 16-yd. cars into a hopper which fed direct over a 10 ft. stationary grizzly, with bars spaced 5 in., into a No. 9 gyratory crusher. Between the crusher and the hopper was a narrow iron gate. An unusually large boulder would block this gate, or get stuck in the grizzly bars, and it then became necessary to sledge the material, so as to enable it to get on to the crusher. This action had tendencies to overcrowd the crusher and belt conveyor, and it was often necessary to stop all the machinery until the jam or overflow was cleared. In this way it produced a very bad effect on the efficiency of the plant.

New Crushing Unit

In order to balance the flow of the plant several changes were made. The size of the gate was enlarged and it was moved farther back into the concrete dumping hopper, so as to allow enough room for the new grizzly feeder, which

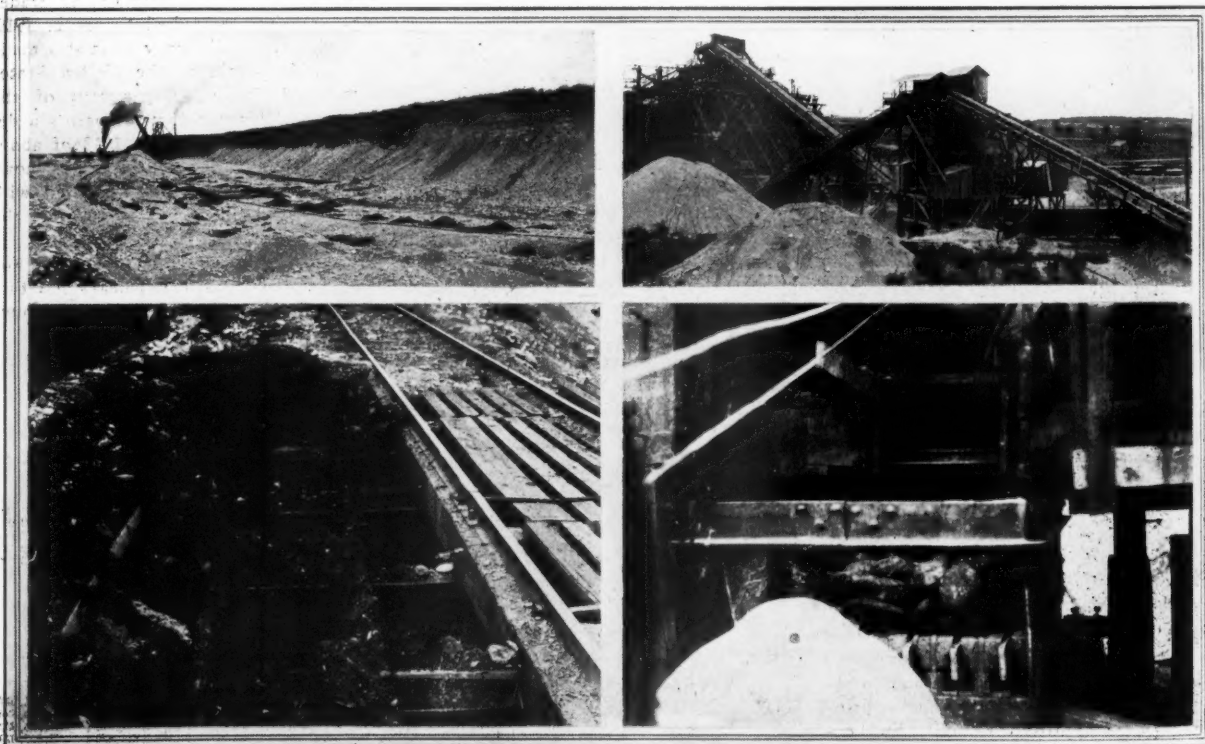
was to be installed instead of the old stationary grizzly.

The new grizzly feeder is really a screen composed of a series of big bars that are attached to an eccentric shaft at the feed end of the screen.

The eccentric is so arranged that as the movable bars drop down and back while the stationary bars hold or carry the load in suspension. In this manner the entire mass of material is agitated in such a manner that the fine material works down through the coarse very easily and rapidly, and drops down through the grizzly openings, while the coarse material passes on over to the crusher.

The grizzly is 12 ft. long and is set at an incline of 6 in. above the horizontal, although a grizzly feeder of this type is claimed to work just as well when it is set horizontal.

The shaft of the eccentric operates at



Above—View of gravel bank.—Two units of Rockdale plant of Chicago Gravel Co. Below—Track dumping hopper feeding grizzly.—Grizzly feeder just above crusher

60 R.P.M. As described before the fine material works down through the coarse and goes down a chute and on to a belt conveyor that also takes up the material as it comes from the No. 9 crusher and elevates it to the crushers.

The new grizzly feeder is manufactured by the Traylor Engineering and Manufacturing Co., of Allentown, Pa., and is sold under the trade name of "Bulldog" grizzly feeder. This installation was

made by Lew J. Hewes, Chicago manager of the Traylor company.

Efficiency Increased

It is claimed that by the installation of this new grizzly the efficiency of the power factor of the plant was increased 50 per cent, and the capacity of the plant almost doubled. The capacity of the plant now is 80 car loads per day. The flow of the plant is now very smooth, and

no shut downs have been necessary since the new feeder was installed.

New Dragline

Another important addition to the company's equipment is now under construction. It is a dragline to be used for stripping overburden, which, when finished, will cost \$50,000. It has a 100 ft. boom and strips to a width of 200 ft. It is being assembled by the gravel company's own forces.

Rough Method of Approximating the Velocity Discharge from Dredging Pipes

Direct Reading Gauge Developed Which Approximates the Velocity and by Which Data on Friction, Percentage of Solids in Suspension, and Quantity of Discharge Can Be Compiled

By Pierce J. McAuliffe
17 Battery Place, New York City

LACK OF A METHOD for determining velocity of discharge from dredging pipes has made it difficult to collect reliable information as to the friction that will be set up in a pipeline when pumping a mixture of sand and gravel at various velocities. The result has been that many installations of hydraulic sand and gravel plants have been made in which neither the proper amount of power nor the requisite number of pump impeller revolutions have been provided to make the unit a success.

A number of ingenious tests have been made to determine the velocity of discharge in dredging pipes when pumping water only. But as the meters used or the methods employed in determining the velocity are not applicable when solids are carried in suspension, the data, while useful in calculating the efficiency of the machine when pumping water, are only indirectly helpful in predicting what will happen when the discharge stream is carrying dredged material.

For the last 12 years the writer has been using a method he devised for approximating the velocity of the discharge stream whether pumping water only or when carrying solids in suspension, and he has developed a direct reading gauge somewhat similar to a carpenter's square by the use of which the velocity can be approximated and data on friction, percentage of solids in suspension and quantity of discharge can be compiled. Fig. 1 gives a sketch of this gauge and the method of its application.

The assumptions on which the writer's

method of measuring discharge velocities are based are, first, that the discharge curve will have a definite form for each velocity through the pipe; second, that but two forces act upon each particle in the discharge as it leaves the pipe, these being the pressure developed by the pump (converted into uniform horizontal velocity), and the force of gravity causing each particle to become a freely falling body. Fig. 2 may assist in understanding these assumptions and will also show the method by which the dimensions for the gauge on Fig. 1 were obtained.

In applying this method the end length

of the discharge pipe should be approximately level. The time that it has taken a particle in the discharge to fall the distance S while traveling along the top curve of the discharge from A to C , can be found by the formulae $S = \frac{1}{2}gt^2$, or, $t =$

$\sqrt{\frac{2S}{g}}$, in which g is gravity and t will be

the time in seconds. Similarly the horizontal distance that the velocity has carried the particle during the time (t) will be L . Dividing L (the horizontal distance), by t (the time of travel), gives the horizontal velocity of the mixture. If the dredge is equipped with a pressure gauge on the discharge line the friction head per 100 feet of discharge pipe necessary to produce the velocity as found by the above gauge can then be determined.

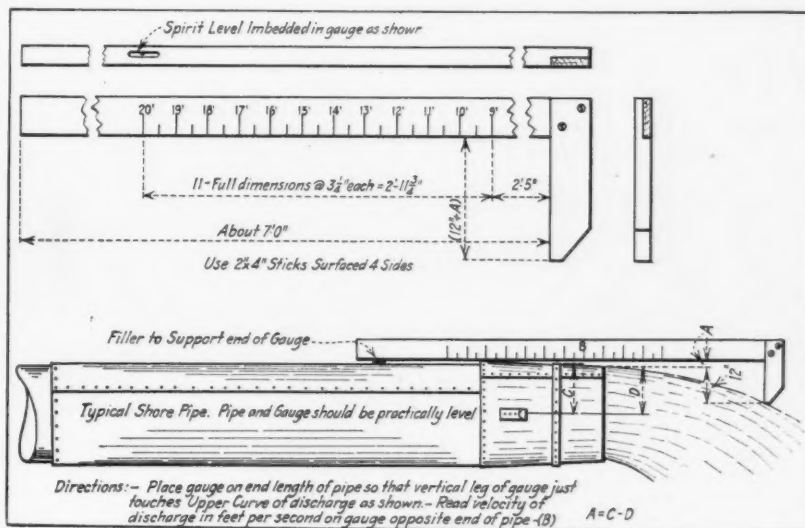
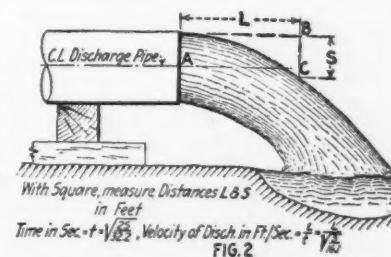


Fig. 1



Hints and Helps for Superintendents

Flexible Spout to Load Cars With Agricultural Limestone

THE ACCOMPANYING VIEW shows a home-made device used to load bulk agricultural limestone at the plant of the Buquo Lime Co., Hot Springs, N. C. It consists of a number of short sections of pipe which fit into one another; being held together by chains so that they are flexible and yet the limestone dust will not sift out. This spout is put in through the car door and the material fed by gravity from the overhead bin.



Flexible spout for loading box cars with agricultural limestone

Side-Loading Gravel and Stone Bins

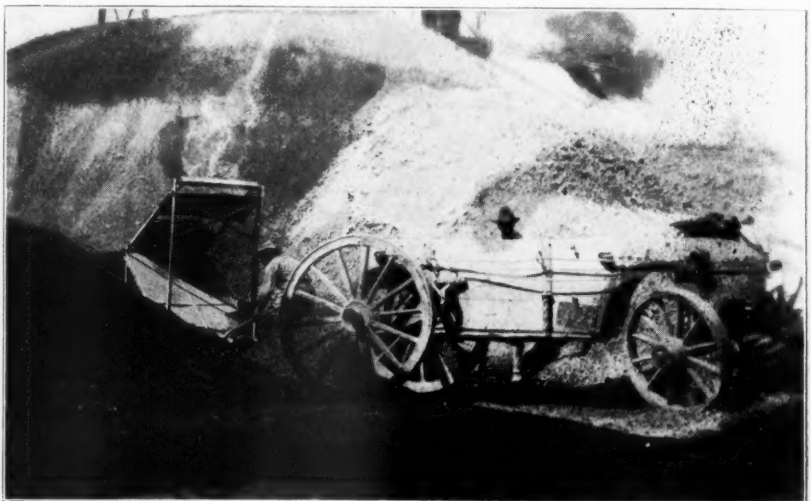
ONE OF THE MOST EXPERIENCED sand and gravel operators in the Chicago district prefers side-loading cylindrical steel gravel bins to any other type, because spouts and loading tracks may be put on both sides of the bins. Instead of placing the spouts in the bins at right angles to the loading tracks they are placed at an angle of about 45 degrees, so that any two of them from adjoining bins may be hooked up together and a mixture of the two bins spouted into cars simultaneously.

Clinker Concrete Cement Kiln Lining

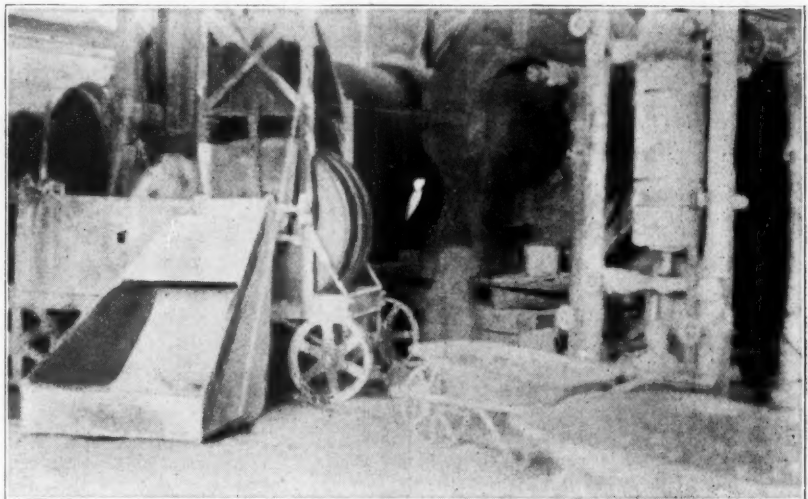
OWING TO THE SCARCITY of good refractories on the Pacific Coast, the cement plants quite generally continue to use kiln linings of clinker concrete. Most of the cement plants use concrete blocks similar to that of ordinary kiln brick liners. These are cast of clinker concrete in steel molds and are cured in the ordinary manner of concrete blocks and then put in place in the kilns with clinker and cement mortar joints.

The Riverside Portland Cement Co. at Riverside, Calif., departs from this practice by casting the lining in place in the kilns. The views below show the screening of the clinker and the mixing and placing of it in the kilns. The lining is placed in longitudinal segments as the kiln is turned.

The clinker concrete is made with a 1:3 mix, that is, 1 part of cement to 3 of clinker of about the consistency of pea gravel and finer. This lining extends the first 30 ft. of the kiln, the remainder being of ordinary fire brick.



Screening and loading clinker for cement kiln lining



Concrete mixer making clinker concrete for kiln lining

The kilns are fired with oil fuel, two burners to a 100-ft. kiln, so that the conditions the lining is called on to withstand are pretty severe. These concrete cast-in-place linings are said to give from 3-weeks to 2-months service. The dry process of cement manufacture is used.

A Screening Layout Which Insures Separation of Screenings

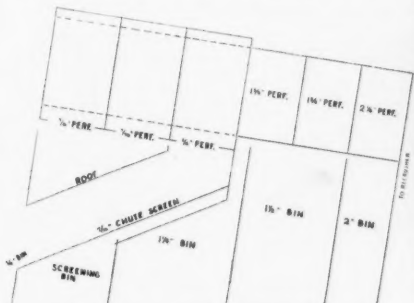
THE SCREENING LAYOUT at the Weston and Brooker Co., crushing plant at Columbia, S. C., has several unusual features. The quarry is operated by a cable-way which has been described in another issue of *Rock Products*. The stone is delivered to the initial crusher in 4-cu. yd. steel skips.

The initial crusher, scalping screen and secondary crusher form a separate unit and are all outside the plant proper and on the ground floor. The product of the initial crusher is elevated a short distance to the scalper screen which discharges directly into a No. 7½ recrusher. The entire product is then elevated to a large jacketed sizing screen.

The accompanying sketch shows how the sections of this screen are perforated to give the desired commercial sizes. The first two sections of the jacket are to

remove the majority of the 7/16-in. down material. The last section of the jacket prepares the ¾-in. material. Since there are still considerable screenings in this product it is passed over another 7/16-in. screen, which has the form of a chute from the end of the jacket to the ¾-in. bin. This screen is immediately over the screenings' bin and the material passing through this inclined screen falls directly into that bin.

The product from the two 7/16-in. sections of the jacket falls upon the roof of the incline screen and are deflected into the same screenings' bin. The sketch will show the flow of the other sizes to their respective bins.



Rotary sizing screen with jacket and inclined gravity screen and bins below



Scalping screen and No. 7½ recrusher a separate unit



Sizing screen over bins, shown in the sketch above

Barrel Packer for Cement

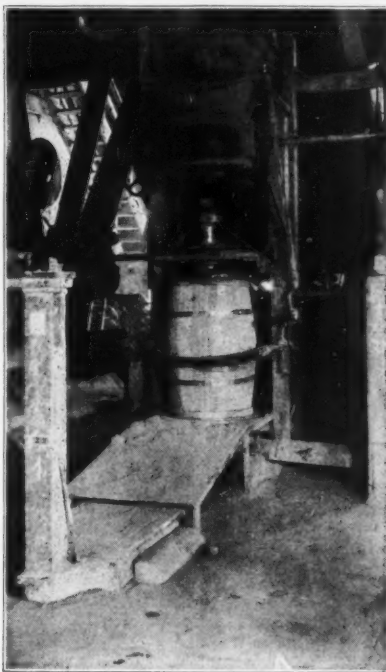
ALL PORTLAND CEMENT plants doing an export business require a packing machine for placing cement in barrels. Possibly because this business is not so extensive as the bag business, it has not been solved by the use of any standard machine, but most plants have solved it in their own way with barrel-packing machines of their own design.

The Santa Cruz Portland Cement Co., Davenport, Calif., does about the largest cement export business on the West Coast and its barrel-packer is illustrated herewith. The barrel is placed on a steel platform which revolves at the rate of 120 r.p.m. The platform is tilted so that the barrel can slide off, by means of a hand lever.

The feeding compartment above the barrel is designed to hold approximately a barrel of cement. The cement is fed out of this by a revolving rake feeder, through a 2½-in. spout, to the barrel, which is provided with a false steel head, or cap, pressed down by means of hand-wheel and screw, like a letter press.

The material is packed so tightly in the process of filling that any overweight in the barrel is readily removed by the use of a special auger, applied through the 2½-in. filling hole, when the barrel is on the adjoining scales. The head of the barrel used while filling is of course provided with air holes, for the escape of the air in the barrel.

The barrels are permanently headed with thin steel heads. These heads have a 2½-in. round in the center with a cap which is crimped in.



Cement barrel packer at Santa Cruz Portland Cement Co. plant

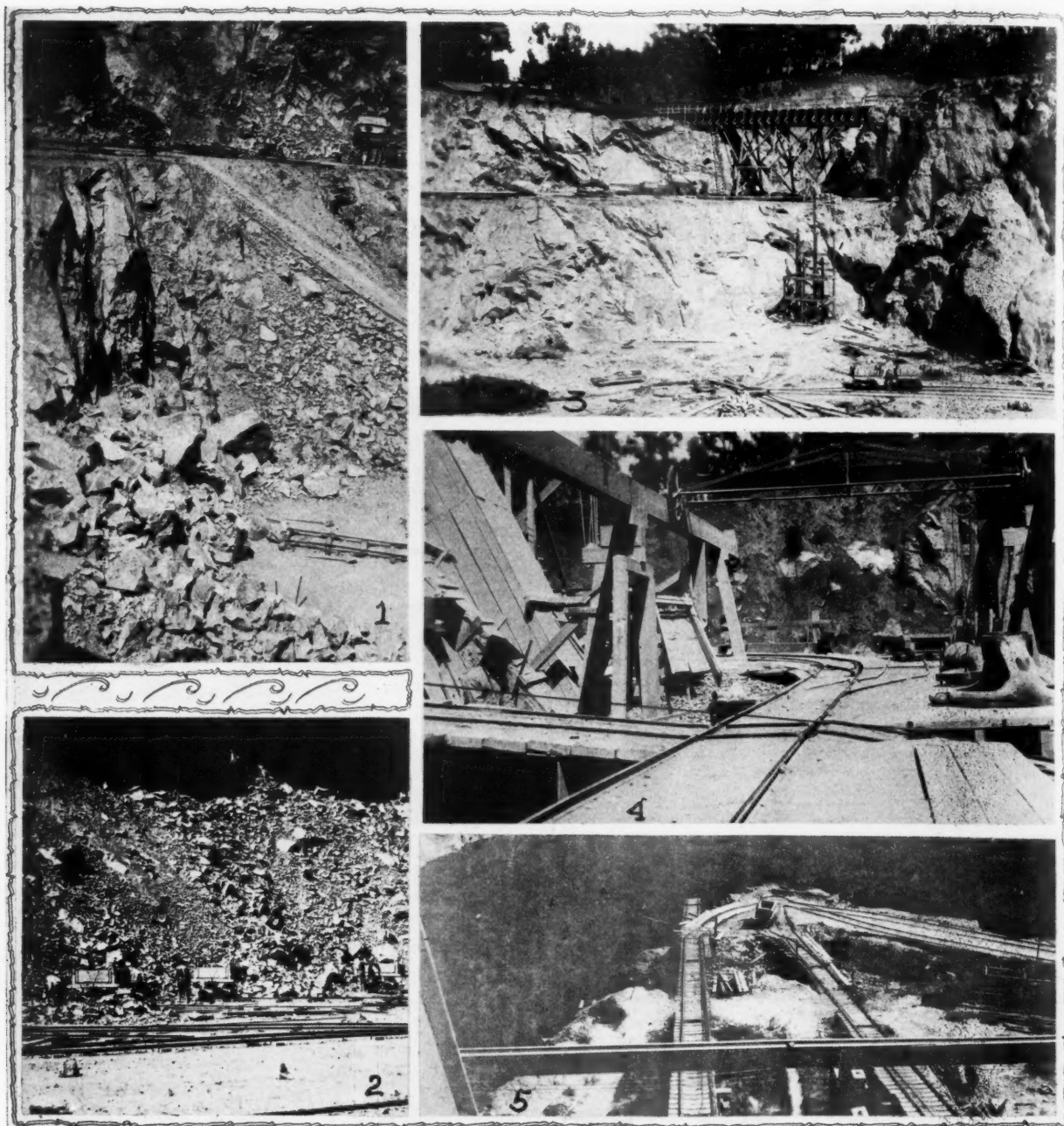
California's Oldest Quarry Plant

In the Heart of the City of Oakland, Has Operated Half a Century and Is Still Going Strong and Adding Improvements

THE OAKLAND PAVING COMPANY ranks among the pioneer quarry concerns of California. Its organization dates back to 1866 when it

commenced to operate its principal holding, a large blue rock quarry within the then city limits of Oakland. Its organizers were C. T. H. Palmer and two other

enterprising citizens, Chas. T. Blake and Moses H. Eastman. Realizing that Oakland was to take its place in the front ranks of the Pacific Coast cities and that



Views 1 and 2. Method of quarry operation. 3. Two quarry levels, showing car lift under construction. 4. Battery of gyratory crushers placed in a row. 5. Tracks from lower level and inclines to crushing plant

the business of street construction and paving would rapidly increase in importance, these three gentlemen entered a field of trade usefulness covering many and diverse branches. In the year 1870 the company was incorporated, the original incorporators being the three gentlemen named above. The quarry property consisted of about 35 acres.

Messrs. Palmer, Blake and Eastman continued in charge of the firm for about thirty years. When all three gentlemen died between 1897 and 1899, they were succeeded by Anson S. Blake and Edwin T. Blake, sons of Chas. T. Blake, and Frank W. Bilger, who had started as an employee of the firm in 1889 and to whose ability and energy the company owed much of its growth. Anson S. Blake, at that time identified with many large commercial projects and director of the Central National Bank of Oakland, became president. Frank Bilger, prominent in municipal affairs and for many years head of the Chamber of Commerce, was secretary. Its superintendent was Edwin T. Blake, a graduate of the College of Mining of the University of California, who had been connected with some of the largest mining companies in the world, notably the London Exploration Company, which operated the famous Treadwell mines in Alaska.

Under the charter the term of existence of the company was 40 years, expiring in 1910, and on that date, the constitution was amended and the life of the company was extended an additional 50 years, or until 1960.

In 1913, Frank Bilger became the president and sole owner of the company. At this time the operations of the company necessitated the employment of nearly 500 men. From time to time improvements were made in the quarry, new crushers and hoists put in, and the dozens of horses and wagons formerly used in transportation were replaced with motor trucks. Later Mr. Bilger's son, Anson S. Bilger, became associated with the company as its secretary, and Mr. Blake again became the president.

Today the Oakland Paving Co.'s quarry is practically in the heart of the city, and yet so hidden that a stranger driving down Broadway would never realize that a few hundred feet away is this large quarry, with deposits of trap rock estimated to contain 5,000,000 cu. yds., after continuous operation for over 50 years.

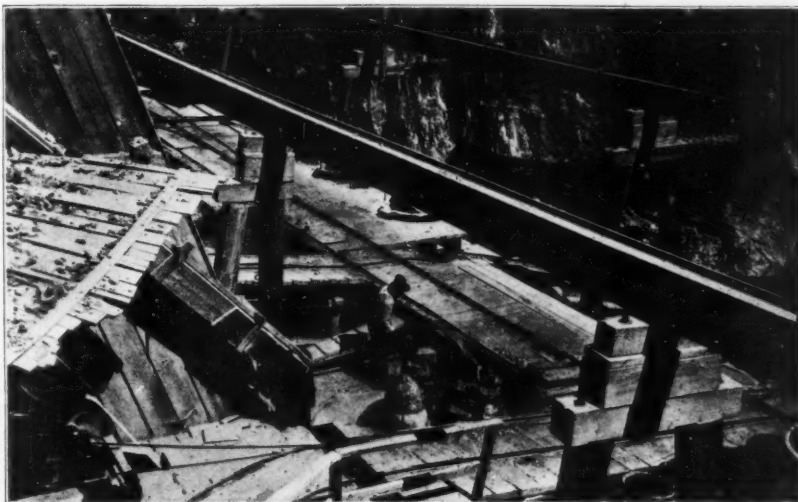
Method of Operation

Owing to its city location heavy blasts and steam-shovel operation are not feasible, but this exceptional location near the center of things, of course, gives it a great advantage in city business, which is all done by motor trucks, there being

no railway connection with the plant.

The design of the plant is old and not at all in accordance with modern ideas,

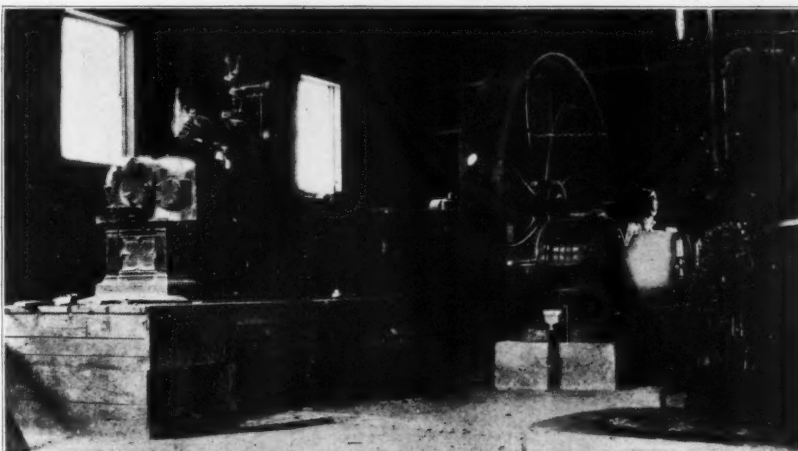
but for the type of operation it is apparently very suitable. The quarry has been operated in three levels or benches (form-



Battery of crushers and dumping tracks. Above is trackway for traveling crane



Type of self-dumping quarry car used



Original prime mover of crushing plant and electric motor which has long since taken its place

ing a face 6,000 ft. long and from 175 to 190 ft. high.) From the upper level the cars are rolled on a practically level track to the battery of gyratory crushers (one No. 8 and two No. 5) placed in a row. The cars side-dump into any one of these crushers and are returned to the quarry on the same tracks.

The second level or bench has been worked by pushing the loaded cars through a tunnel under a highway to the foot of a series of cable-operated inclines on the farther side of the plant. These cars were similarly side-dumped into the

hoppers of the crushers but from tracks at right angles to the first level tracks. Because of the long car movement this operation has been supplemented by the installation of a vertical car hoist or elevator from the second level to the tracks of the first level. To carry the scheme to completion the cars could be returned to the lower pit by gravity through rearranging the old tracks. The lowest level is now flooded and no longer worked.

The arrangement of the crushing plant, as can be easily seen from the views, is

the result of the growth of business and the nature of the operation, which prevented increasing the plant's capacity by the simple installation of a large crusher and conveying machinery.

Each crushing unit is complete in itself with elevator and sizing screen and re-crusher. While this undoubtedly has its disadvantages in requiring more labor when operating to capacity, it has its advantages too in flexibility of operation and output with a minimum expenditure for power and for wear and tear on machinery and equipment.

Stone Production in 1919

THE QUANTITY OF STONE sold in the United States in 1919 for different uses amounted to about 71,380,000 short tons, an increase of 4 per cent over the quantity sold in 1918 but considerably less than that sold in 1917. Increases were recorded for most of the products whose output was curtailed during the war, but decreases were made for the most urgent war products—flux, refractory materials, and limestones for use in manufactures, the quantity of flux decreasing 25 per cent.

The total value of the stone sold in 1919 was about \$115,000,000, far in excess of any value previously recorded. Record values were made by granite, basalt (trap rock), marble, limestone, and miscellaneous stone, and the value of the sandstone sold exceeded that for any year since 1914. This unusual increase in the value of the products of the stone industry, like the increase in the value of the products of other industries, is attributed to the larger cost of supplies, fuel, and especially of labor. The producers reported that business was poor during the first part of the year but gradually improved until, during the last six months, the demand exceeded the output that could be made with the insufficient and inefficient labor available.

This preliminary estimate has been made by A. T. Coons, of the United States Geological Survey, Department of the Interior.

Large Increase in Paving Stone

The manufacturers of granite paving blocks in the eastern part of the country report an increase of nearly 40 per cent in quantity, those in Minnesota and Wisconsin report an increase of more than 50 per cent, and those in Missouri report a decrease of 25 per cent. Returns from relatively few producers of granite paving blocks indicate an increase in average price of about \$10 a thousand. The output of sandstone blocks also decreased. The entire paving-block industry therefore made an estimated increase of 36 per cent in quantity and of about \$6 in average price per thousand.

Curbstone and Flagging

A gain of about 748,000 cubic feet, or nearly 79 per cent, is estimated for the curbstone produced in 1919. Reports from a number of individual producers show increases in quantity ranging from 30 to 193 per cent, but not much change in the average price.

Reports from firms producing flagstone indicate a decrease of about 12 per cent in output, though a few of the larger producers report small increases.

Riprap and Rubble

No attempt was made to obtain figures showing the production of riprap and rubble in 1919, but the indications are that no considerable increase or decrease will be recorded from either product, though there will be an increase in the average price per ton.

Crushed Stone

Observers in close touch with the crushed-stone industry estimate an increase of 25 to 50 per cent in the quantity of crushed stone sold in 1919. Returns from several producers showed still larger percentages of increase, but others reported decreases, and the average increase was probably about 35 per cent. Prices were generally reported to be higher in 1919, but some producers reported that their prices were less than those in 1918 or about the same. The most serious complaint of the crushed-

stone producers was car shortage, but lack of labor and high cost of materials were also keenly felt. Many crushed-stone plants that were inactive in 1917 and 1918 resumed operations in 1919.

Flux

The quantity of limestone sold for use as flux reached its maximum in 1917, and its decrease of 6 per cent in 1918 was followed by a decrease of about 25 per cent in 1919. The estimated value, however, was the highest ever recorded for this product. The price given by the producers who have made their reports range from 75 cents to \$2 a long ton.

Refractories

The sales of dolomite used for making refractory products that are used in the steel industry decreased at least 50 per cent in quantity in 1919. The sales of ganister and mica schist, which are ultimately used in lining furnaces and kilns, also decreased.

Stone Sold for Other Uses

The greater part of the stone sold for uses other than those noted above was pulverized limestone used in agriculture. The quantity sold in 1919 increased about 25 per cent. The quantity of stone sold for use in the manufacture of alkalies and in other chemical processes, which forms a considerable part of the limestone sold each year, showed a decrease in 1919.

Stone sold in the United States, 1918-19, by uses.

Use.	1918		1919*	
	Quantity.	Value.	Quantity.	Value.
Building stone.....cubic feet.	8,616,899	\$7,454,973	9,300,000	\$10,000,000
Approximate equivalent in short tons.....	719,200		785,000	
Monumental stone.....cubic feet.	4,072,342	9,912,167	5,300,000	17,000,000
Approximate equivalent in short tons.....	343,100		446,000	
Paving blocks.....number.	28,516,910	1,714,011	39,000,000	2,600,000
Approximate equivalent in short tons.....	298,650		410,000	
Curbing.....cubic feet.	951,650	661,188	1,700,000	1,300,000
Approximate equivalent in short tons.....	80,570		147,000	
Flagging.....cubic feet.	798,934	373,729	700,000	450,000
Approximate equivalent in short tons.....	65,930		58,000	
Rubble.....short tons.	482,365	635,895	480,000	750,000
Riprap.....do.	2,273,852	1,922,154	2,300,000	2,300,000
Crushed stone.....do.	29,373,342	27,951,393	39,650,000	49,000,000
Furnace flux (limestone and marble).....long tons.	23,917,040	23,512,636	17,950,000	22,400,000
Approximate equivalent in short tons.....	26,787,085		20,104,000	
Refractory stone (ganister, mica schist, and dolomite).....short tons.	1,825,183	2,363,154	1,000,000	1,600,000
Manufacturing industries (limestone).....do.	4,809,393	4,107,394	6,000,000	7,000,000
Other uses.....do.	1,504,660	2,000,737		
Total (expressed approximately in short tons).....	68,563,300	82,700,430	71,380,000	115,000,000

* All figures estimated.

* Includes stone used for agriculture, in alkali works, sugar factories, glass works, paper mills, and other chemical industries.

* Includes stone sold for asphalt filler, whitening or chalk substitute, poultry grit, roofing material, stucco and terrazzo work, filter stone, and other uses not specified.

A Modern Stone Industry With Interesting Features

The Dolomite Products Co. Has a Plant for the Manufacture of Artificial Magnesite and Pulverized Limestone

THE DOLOMITE PRODUCTS CO., operating a large quarry at Maple Grove, Ohio, is particularly interesting because of the character of the rock, the modern equipment which it employs throughout and the development of a product which serves the open-hearth steel furnaces as a substitute for Austrian magnesite, this by-product being known by the trade name of "Magnefer."

The dolomite that is quarried here is pure and uniform to a depth of 420 ft. It analyzes 55% calcium carbonate, 44.3% magnesium carbonate with less than 1% of impurities. Since this material, so far as known, has a larger percentage of magnesium carbonate than any deposit of dolomite in the eastern or central United States the company has been led to specialize in supplying the large steel companies of the country with raw dolomite which is employed as a flux and open-hearth material. On the other hand considerable stone is supplied for road and concrete work, and as the

character of the product makes it ideal for agricultural purposes, the company also supplies screenings to the farmers at an increasing rate each year.

Previous to 1908 the quarry was hand operated. At that time the Holran Stone Co. built the original crushing and screening plant and that date marks the commencement of its development with modern machinery until at the present time it is one of the largest producers of crushed dolomite in the country. In 1916 the Dolomite Products Co. succeeded the Holran Stone Co. and completed in 1918 the construction of the burning plant, a very modern and complete building for the manufacture of "Magnefer."

Stripping and Blasting

The stripping is a very simple operation. Since the stone has no crevices or pockets and the overburden in no place exceeds 8 ft., the three or four feet of clay is removed by a small steam shovel

with a three-quarter cubic yard dipper. This machine has been steadily in operation since 1908 and has removed some 400,000 cu. yd. of material, which is hauled to waste stock piles.

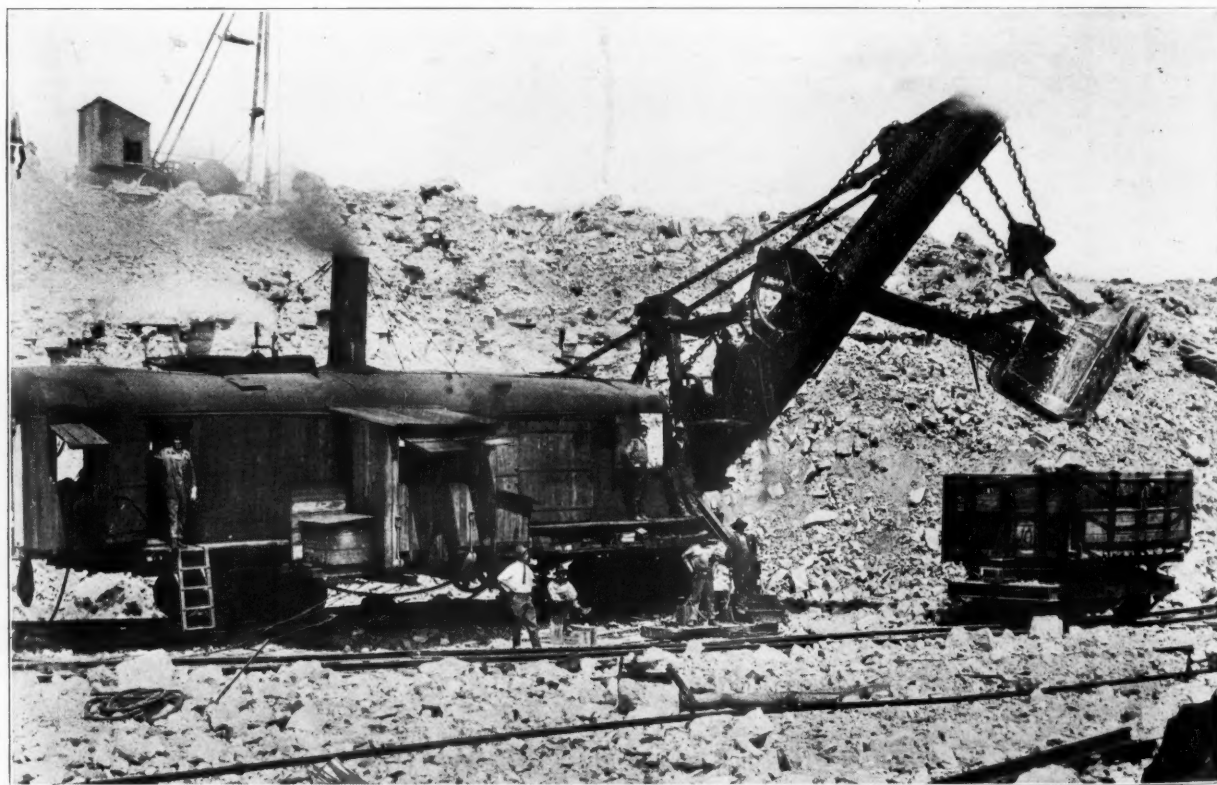
Owing to the peculiar stratification of the rock considerable difficulty has been encountered in blasting. At present the drilling is done with electrically operated well drills, a 5½-in. hole progressing at the rate of 75 ft. per day per drill. A single row of holes is shot at a time, these being drilled 12 ft. from center to center and 15 ft. from the 44-ft. face. Generally nine holes constitute one shot, the charge being divided between gelatine powder, which is employed at the bottom to counteract the effect of water, and starch powder from a depth of 20 to 30 ft. from the top. Three detonators are used per hole with a current of 250 volts to set them off. It is claimed that one pound of powder is required for 2½ tons of stone and the rock is disrupted and shattered, but is moved out of place



Quarry of the Dolomite Products Co. just after a blast, showing character of ledge and manner in which it breaks up



Small steam shovel stripping quarry overburden



Woodford electric quarry car and 95-ton Bucyrus steam shovel working in ledge

only to such an extent as to form no inconvenience in the regular operations.

Steam Shovel Excavation— Electric Transportation

In quarrying the stone proper the company has used from the first three steam shovels, one 95-ton machine with a $3\frac{1}{2}$ -cu. yd. dipper and two of 70-ton equipped with $2\frac{1}{2}$ -cu. yd. dippers. The experience of the company has been that better results are obtained from the use of the smaller machines.

The pit is some fifty acres in extent and the shovels are distributed around the face; each taking cuts from a certain portion, and all feeding cars on the same track. A standard-gauge track is laid around the pit so that the cars move all around in one direction.

The Dolomite Products Co. was one of the first in the country to install the

electrical system of central controls in quarry transportation. This system was in its primary stages when first utilized at Maple Grove and consequently experience taught that many changes were necessary before the system could be employed most economically and advantageously. In the first place it was found that the same motor equipment could operate cars of larger capacity and with consequent less repairs on the car bodies.

The present capacity of the cars is 16 tons each with each car equipped with one 25-h.p. motor on each of the two axles. At first trouble was encountered in the use of the shoe for the third rail since a stone projecting slightly above this rail would interrupt the contact. This was overcome by the use of a home-made shoe that is much larger and curved on the bottom so that it

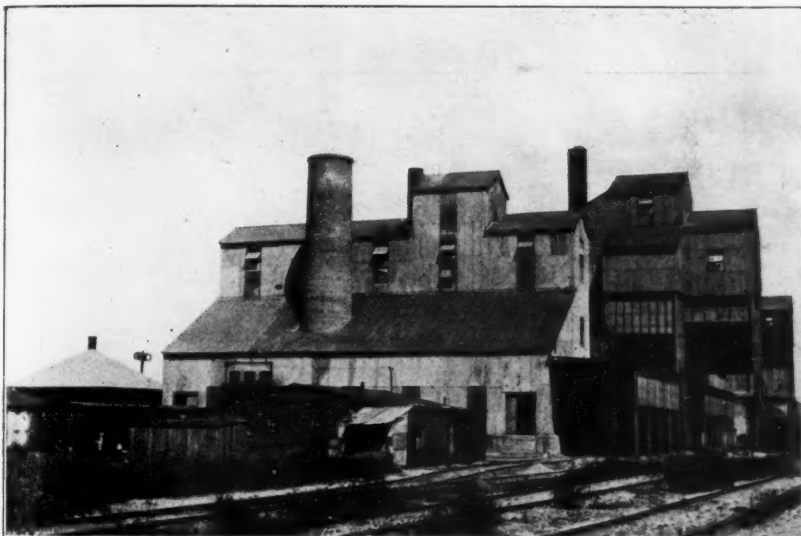
either displaces the rock or is only pushed off the rail and later regains its position. These cars are driven by direct-current supplied from a 300-h.p. synchronous motor generator set recently installed by the company to meet its increased demands. The initial generator which was of 150 h.p. will be employed as a spare and to furnish additional current when the company undertakes to open up its second level which project it is now commencing.

Each car is controlled from a central tower situated at the unloading hopper, although for convenience in spotting cars there are controls at each shovel. From the quarry floor the cars are brought up a five per cent grade to the crusher, where they are automatically unloaded and passed immediately to the quarry circuit. The company owns and operates 10 cars at the present time with the expectation of immediately doubling this equipment. It has been found at this quarry from a careful study of the costs for this system that there is considerable advantage over steam operation provided there is sufficient car equipment to enable the operator to inspect and repair regularly and thoroughly. Repair and operating costs can be kept well down by such inspection so that the troubles are caught before they become serious.

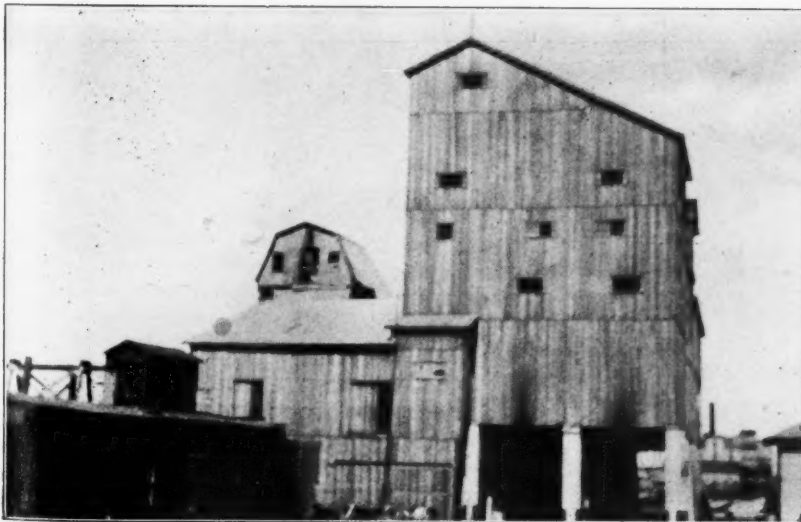
Crushing Plant

In order to reduce the secondary shooting to a minimum the initial breaker is a 48 by 60-in. jaw crusher. As with all machinery throughout both the screening and burning plants this crusher is operated by a 200-h.p. motor. Until recently a large Corliss steam engine supplied by a battery of four boilers furnished the power for this machine as well as for an elevator and several screens. The pumping of the quarry hole was accomplished by steam pumps. In the course of the past year electricity, which is purchased from the Ohio Power Co., has entirely replaced steam and the machinery is electrically operated throughout. The cars dump the rock into a large steel hopper and an apron feed regulates the flow of material to the main breaker, the capacity of which is 5,000 tons of material per ten-hour day. The jaw crusher reduces the rock to 10-in. size and less.

A large steel pan elevator of equal capacity to that of the crusher elevates the material 100-ft. and deposits it into two No. 10 gyratory crushers each of which affords the initial crushing for two separate and distinct screening and crushing plants. From each gyratory the stone now crushed to sizes not exceeding 6-in. is elevated by a second steel pan elevator to scalping screens. When making flux the material from 6 to 4 in., which is that rejected by the first set of



Magnefer and pulverized limestone plant



Crushing plant of the Dolomite Products Co., Maple Grove, Ohio

large rotary screens is chuted immediately to bins. At other times this material is returned to 22x54-in. crushing rolls. Each of these two screening units is arranged so that each size above the smallest can be recrushed and the full capacity of the plant can be devoted entirely to the smallest size if necessary.

The screens in each unit are identical as are also the crushers. Formerly the tailing crushers in one unit were No. 5 gyratories, but these have been replaced by rolls which have been found to be more satisfactory. As already indicated this is a four-stage double unit crushing plant. The primary breaker reduces the materials from 48-in. to 10-in. The second stage is from 3-in. to 2-in., the third stage is from 3-in. to 1½-in. and the last stage is from 1½-in. to dust.

The screening is done by large cylindrical jacketed screens and the commercial sizes are gravity chuted to bins. All screens are gear driven from electric motors. Over sizes are re-chuted to secondary crushers and elevated by standard elevators. The most interesting part of the arrangement is that the material from any bin may be returned to the smaller crusher and reduced to the required sizes.

The storage bins of two cars' capacity and are made of concrete. Two loading tracks are provided for handling the output and each is equipped with 150-ton railroad scales situated in such a way that a car is loaded and weighed at one and the same time. In the past year considerable has been accomplished to enable the plant to operate at its entire capacity which is 5,000 tons or 100 cars per day, but operations have been curtailed because of the prevailing shortage of railroad equipment.

Machine Shop

The original machine shop, which was a separate building devoted to repair work and serving likewise as a store room, has been outgrown by the needs of the company and a large modern concrete building is at present in the course of construction. This building will be further augmented by an erecting shop which will be of sufficient capacity to enable the company to completely overhaul its steam shovels and other equipment. The plans for the structure which is at present in the building include a large lunch room, locker room, showers and toilet facilities for the benefit of the employees.

Utilization of Screenings

There was a time in the history of the company when the screenings were actually a waste product and in the earlier years these were literally given away. However, when it was found that the analysis of the stone in its raw state was chemically ideal for the purposes of the farmer for overcoming acidity of the soil



Level quarry with houses constructed by company for employees



Hard dolomite quarry face



Third-rail operated quarry car of Woodford electrical system of central control

and supplying both calcium and magnesium plant foods, the company disposed of much of this fine material in this way and built up a large clientele among the farmers of Ohio and neighboring states.

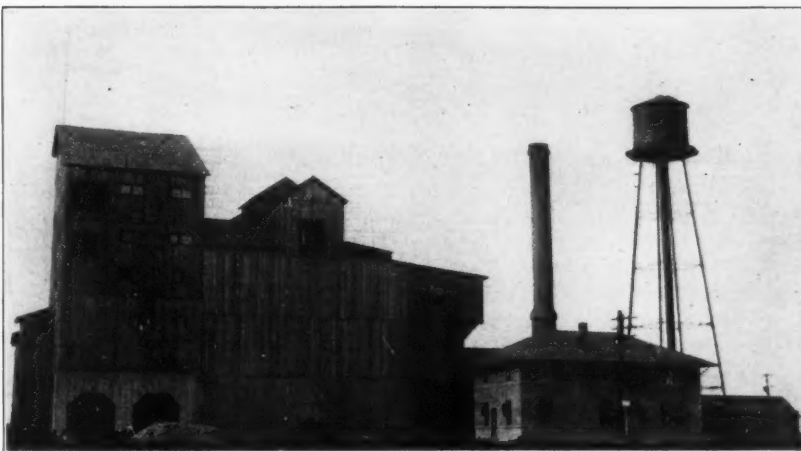
But this outlet for screenings did not grow in proportion to the amount of screenings which were produced as the output of the plant developed. With the advent of the European war and the consequent cessation of shipments of magnesite from Austria a demand for a basic material for the building of bottoms and a lining for open-hearth furnaces was felt throughout the steel industry. It had been previously shown that calcined dolomite could be substituted to a large extent for magnesite in patching the bottoms of such furnaces and many of the larger steel plants had built their own calcining plants and some of these were furnished with dolomite by this company. However, it was known that the single or double burned dolomite was not suitable for the actual construction of bottoms in the open-hearth furnaces.

The Dolomite Products Co. was one of a few concerns that set about to supply this want at a time when the demands upon the steel companies for war materials was so urgent, which was coincident with a serious situation arising among the producers of basic open-hearth steel for the want of a bottom material. It was developed that a synthetic magnesite could be made which would replace genuine magnesite and this company set about the construction of a modern plant for the manufacture of such material. This process was to utilize the excess screenings and consequently the company has operated with no waste product.

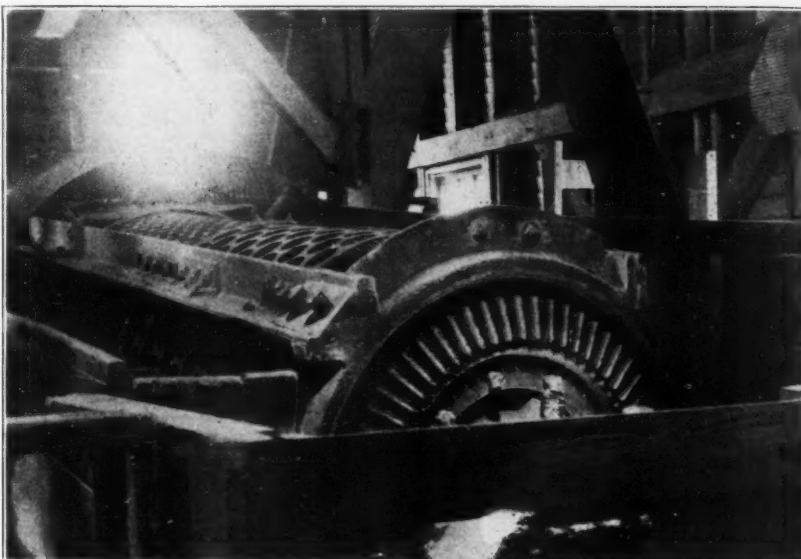
As originally planned the new plant included machinery for the drying and further screening of the raw stone for the purpose of meeting what was then supposed to be a demand by the farmers for the finer material. It has since been proven that the screenings in their natural state are more in demand since the larger particles enable the farmer to get an advantage from them by the constant feeding of his soil over a period of years. The disintegration taking place more slowly with the coarser particles than with the finer. Therefore what were previously used as dryers (there being three in number) are now kilns for the additional manufacture of "magnefer" which has steadily grown in popularity among the steel companies.

The screenings are conveyed from the upper to the lower plant in hopper cars and there are automatically elevated to storage bins. The other materials which go into the manufacture of "magnefer" are handled in like manner.

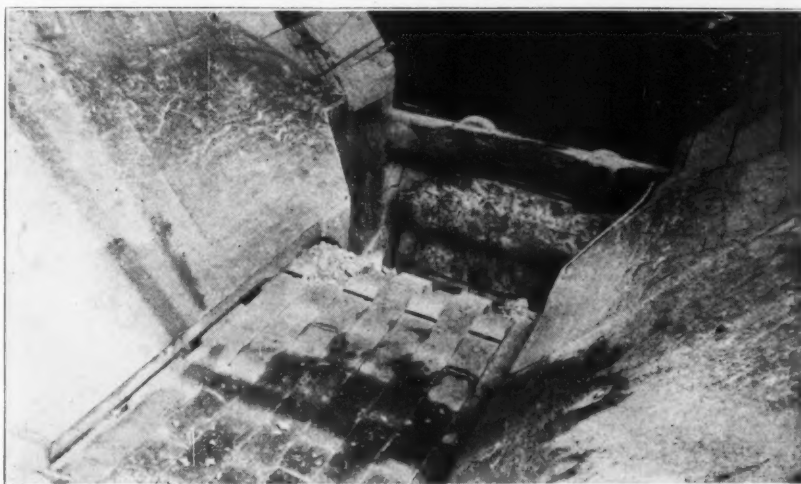
One of the interesting features of this plant are the poidometers which auto-



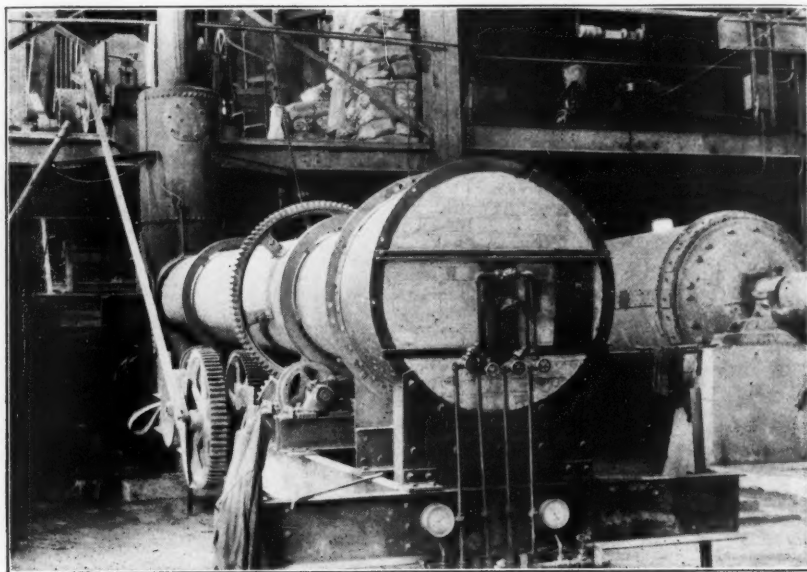
Crushing plant and offices



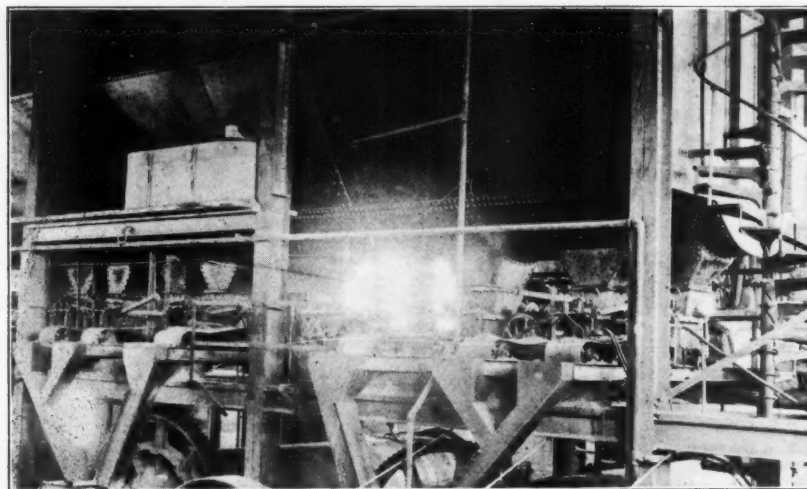
Jacketed cylindrical sizing screen



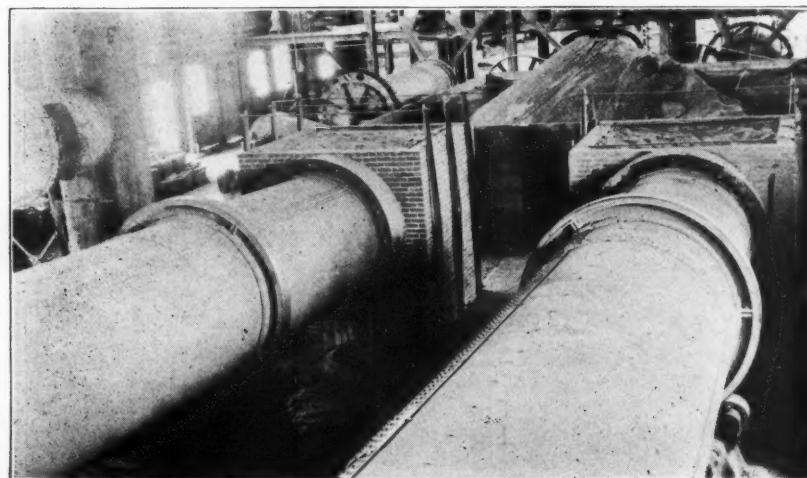
Apron feed to jaw crusher



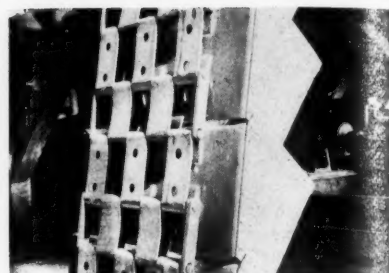
Experimental kiln used to perfect process



Schaffer poidometers to regulate feed of materials to ball mills



Battery of agricultural limestone driers



Steel chain bucket conveyor

matically feed and weigh the correct proportions of a slurry which is mixed in a series of tube mills where with the addition of water they are finely ground. It is then conveyed to storage tanks and fed in its wet state to the kilns where it is burned at a very high temperature.

After passing through the rotary kilns and other different stages of development, the material is deposited into the coolers. From here it is taken up by a pan conveyor or elevator and deposited into bins, from which it is automatically loaded into cars for shipment.

Experiments by Noted Chemists

The perfection of the manufacture of "magnefer" was obtained after exhaustive experiments carried on under the direction of such noted chemists as S. B. Newberry, president, and H. N. Barrett, chemist of the Sandusky Portland Cement Co. The design and construction was largely the result of the united efforts of C. J. Reilly, consulting engineer of the Sandusky Portland Cement Co. and of Walter Patnoe, engineer and general superintendent of the Dolomite Products Co. The plant is essentially modern in every detail and is unusual because of its many labor-saving devices. It is operated in two 12-hour shifts of seven men to a gang.

One of the views shows the small experimental kiln that was used in perfecting the process, which, with the product and the machinery used, is covered by patents.

Officers

The organization of the Dolomite Products Company is as follows: D. P. Eells, president; R. H. Crowell, vice-president; H. P. Eells, general manager and treasurer; L. Ravenel, secretary; W. W. Patnoe, general superintendent; P. Hanson, superintendent of quarry; S. Brown, superintendent of burning plant; S. Eells, manager of purchases; J. F. Mollen, manager of sales; H. A. McPolin, charge cost accounting and record department.

For the information contained in this article **Rock Products** is indebted to H. P. Eells, general manager, and S. Eells, manager of purchases.

Practical Chemistry for Lime and Cement Manufacturers

XII—Fuels for Boilers and Lime Kilns—Carbon—Forms of, and Chemical Properties

CARBON IS ONE OF THE MOST IMPORTANT chemical elements and the chemistry of its compounds is a branch of itself—*Organic Chemistry*. Organic chemistry was formerly considered as the chemistry of substances derived from the animal and vegetable kingdoms. It was found, however, that these compounds were capable of being extended far beyond the range of occurrence in nature, so that now organic chemistry is considered as the chemistry of carbon and its compounds, chiefly with hydrogen, oxygen and to a lesser degree with nitrogen, chlorine, sulphur, bromine and iodine.

Forms of Carbon

Originally the substances treated of in organic chemistry were all found in the bodies of plants and animals or were prepared from substances found in these. For a long time it was supposed that these substances could only be prepared from living organisms. Now, many natural organic compounds are obtained artificially either from the elements direct or from simpler organic compounds. Such process of production we call *synthesis*. In addition to the organic compounds found in nature, innumerable new compounds of carbon unknown in the animal and vegetable kingdoms have been worked out. Among these are most of the coal tar dyes, numerous drugs such as aspirin, deadly war gases like mustard gas, and powerful explosives such as T N T.

Carbon exists in three forms, all of which are familiar to most of us—the diamond, graphite and amorphous carbon. The diamond is merely crystallized carbon and it can be burned in oxygen, when carbon dioxide will be produced just as if charcoal had been employed.

The diamond is the least common form of carbon and it is also the purest natural carbon. Diamonds are found in South Africa, India, Borneo and Brazil, and occur scattered through volcanic and metamorphic rocks. The diamond is the hardest known substance. It is practically unaffected by chemical reagents and can be dissolved by only one or two known chemicals, such as molten iron. Moissan, a French chemist, prepared minute diamonds by dissolving carbon in molten iron and cooling under certain conditions.

Graphite is also a crystalline form of carbon. It is a soft black crystalline mineral. It is practically infusible and can be burned in air only with much difficulty.

By Richard K. Meade, M. S.
Consulting Chemical and Industrial
Engineer, 11-13 E. Fayette St.,
Baltimore, Md.

Graphite, also called "plumbago," is found chiefly in Ceylon and Siberia. Some small flake graphite is found and mined in Alabama. Unlike the diamond, graphite is extremely soft and conducts electricity. Graphite can be prepared artificially in which coal, anthracite or other forms of amorphous carbon are heated in the electric furnace in a reducing atmosphere, and then allowed to cool slowly. That used as a refractory is generally prepared from anthracite, and the artificial product is now much more common than the natural. Graphite is used largely for making crucibles. For this purpose, it is necessary to mix with it a certain amount of good fire clay, since graphite is not plastic. The amount of clay used varies from 50 to 75 per cent, depending upon the grade of the crucible. Graphite is also used in making the anodes in electric furnaces and cells, in "lead" pencils, in paint, and as an aid in lubricants. It is the most refractory material known, but can be used only under reducing conditions; it burns under the influence of oxidizing flames and oxidizing fluxes.

By *amorphous* is meant not crystalline. Various familiar forms of amorphous carbon are charcoal, bone black and lamp black. Coke is an impure form of carbon.

Coke is made by heating coal until all the volatile matter in this is driven off, leaving the carbon of the coal behind. Coke is used chiefly in metallurgy and in burning lime in "pot" kilns. Lamp-black is made by burning heavy oils and resins and cooling the smoky flame obtained. The soot so collected is lamp black. There are various grades of lamp-black. The soot from the flame is received into different chambers arranged in a series. The black that collects in the first chamber contains a certain amount of oily matter which has passed off unburned. On this account it has a brownish or grayish tint. That in the farther chambers is freer from the oily deposit. Lamp-black in general possesses a grayer tone than many of the other carbon pigments, so that it may be recognized by this fact. This is used in printers' ink, paint, etc. Charcoal is made by heating wood out of contact with the air, when it

decomposes, carbon remaining and the other compounds formed distilling off. Bone black is made by heating bones. Pure carbon is usually obtained in the laboratory by charring sugar.

Chemical Properties of Carbon

The compounds of carbon are of the utmost importance to the lime and cement manufacturer, and hence some space will be devoted to their study.

The affinity of carbon for oxygen is low at ordinary temperatures, but at high temperatures it is greater than that of most of the known elements. This property is made use of to extract the metal from the oxide—in iron smelting for example, the carbon of the charge extracts the oxygen from the ore (iron oxide) and leaves the iron free.

Carbon unites with oxygen to form two gases, carbon monoxide, CO, and carbon dioxide, CO₂, both of which are intimately connected with the phenomena of combustion.

Carbon also unites with many metals and non-metals at high temperatures, such as are obtained in the electric furnace forming carbides. With calcium, for example, it forms calcium carbide, CaC₂, and with silica, carborundum, SiC.

(To be continued)

Sand-Lime Brick in 1919

THE SAND-LIME BRICK produced in the United States in 1919, according to an estimate made by the United States Geological Survey, Department of the Interior, amounted to 145,000,000 brick, valued at \$1,725,000, an increase of 47,000,000 brick and of \$841,000 over 1918. The maximum output of sand-lime brick—227,344,000 brick—was made in 1916, but the maximum value was that of 1919.

The output of common brick was 142,755,000, valued at \$1,688,000, an increase of 45,937,000 brick and of \$822,000 compared with 1918. The rest of the output was face brick, which showed an increase of 664,000 brick, and of \$19,000 compared with 1918. The average price of common brick per thousand in 1919 was \$11.82, compared with \$8.94 in 1918, \$7.54 in 1917, and \$6.43 in 1916. The average price of face brick in 1919 per thousand was \$16.48, compared with \$11.35 in 1918, \$9.36 in 1917, and \$9.64 in 1916.

Hydraulic Method of Cleaning Phosphate Rock

Process and Machinery Used at the Ruhm Phosphate Mining Company Plant
Typical of Central Tennessee Practice

FOR COMMERCIAL PURPOSES rock phosphate must usually be concentrated to contain 65 to 80 per cent of "bone phosphate of lime" (B. P. L.). The material quarried or mined nearly always contains considerable clay, silt and other impurities which must be removed.

The ordinary method of removing these impurities is by washer of the log type and similar means. At the plant of the Ruhm Phosphate Mining Co., this process is simplified somewhat because the phosphate rock (or gravel as it is locally called) is excavated and conveyed to the plant by hydraulic methods.

The phosphate, soil and water is all pumped from the mine to a screening tower, where it is first sent into a small cylindrical screen, which merely makes a separation between the lumps and the sand. The sand and water is caught in a basin underneath the screen and sent to the "can" washers. The larger material (over $\frac{3}{8}$ -in.) is caught at the end of the screen and sent through a small pug-mill where the clay and dirt are loosened and the gravel

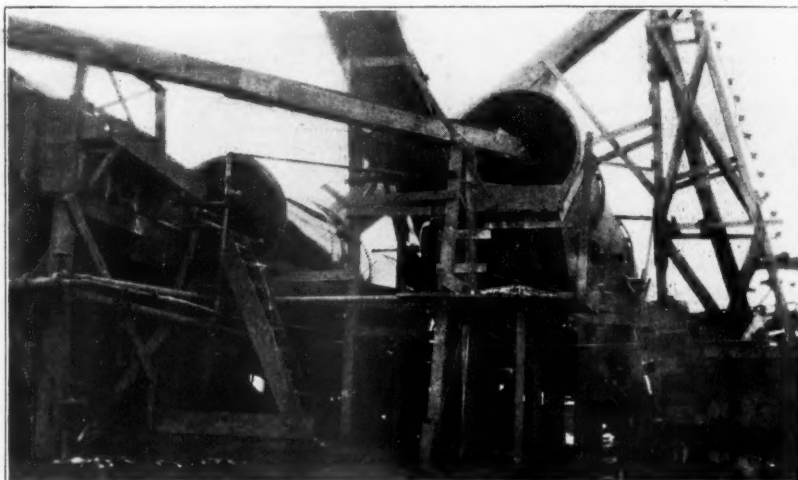
again joins the sand at the "can" washer.

"Can" Washers

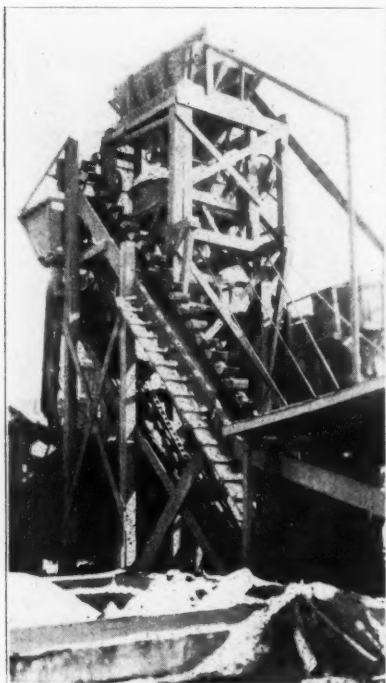
Since the "can" washer is limited to the phosphate field it is worthy of a complete description. In outward appearance the washer is a large sheet iron cylinder some 6 ft. in diameter and 25 to 30 ft. long. This is set at a slight inclination so that there is a general tendency for material heavy enough to settle out to work toward the lower end of the cylinder. At

the lower end there is an abrupt shoulder, where the diameter of the "can" is reduced to about 4 ft. The 4-ft. section of the "can" is perforated with $\frac{1}{2}$ -in. round holes.

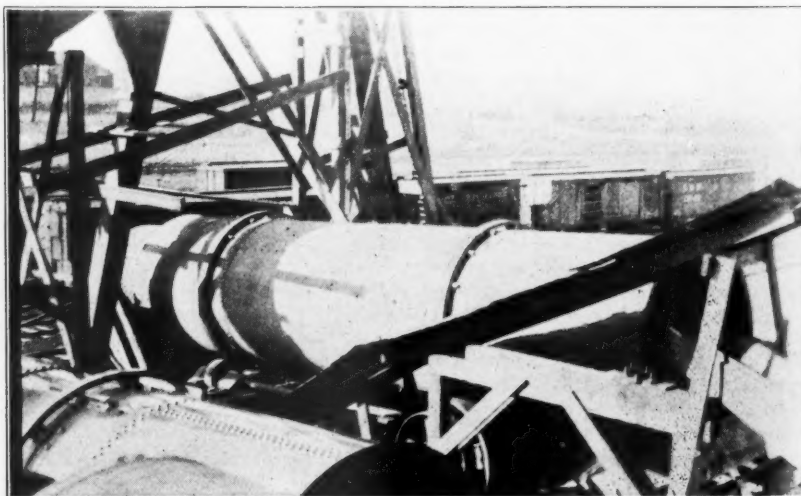
The design of the "can" is such that only the heavy material gets out into the screen end. On the inside of the "can" and upon the shoulder there are six equally spaced shelves or vanes, so designed that as the "can" rotates these shelves dip into the water and pick up some of the lumps



Can washers. Material is fed and discharged at this end



Elevator pebble phosphate from sump at end of riffles

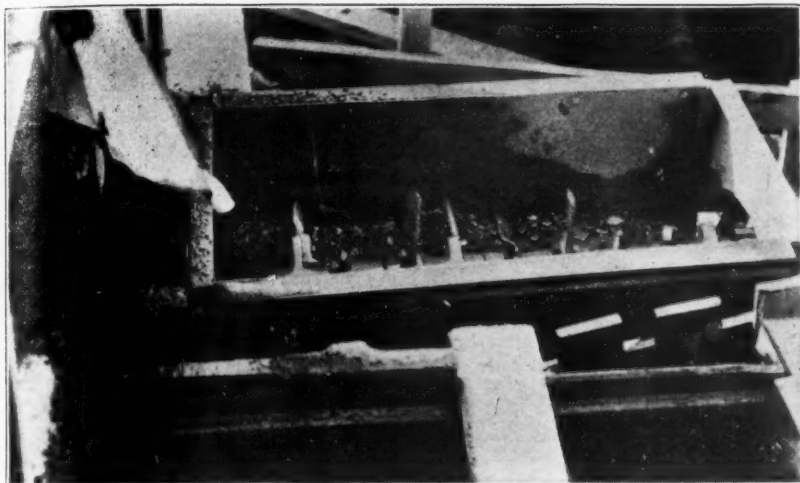


Another view of the can washers. Peculiar to Tennessee phosphate field

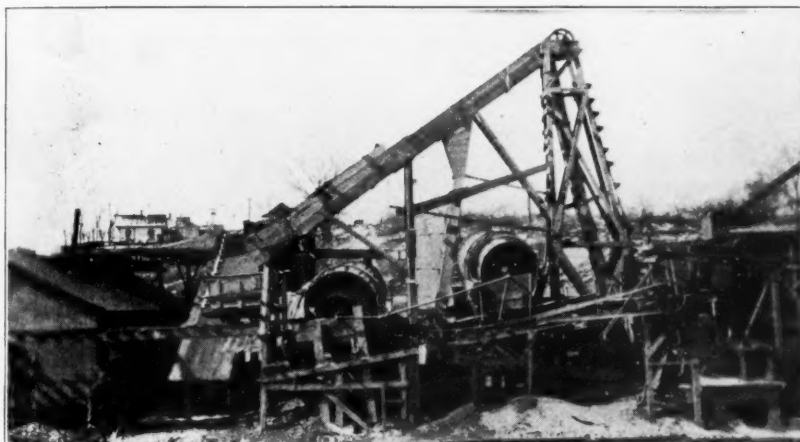
and heavy sand. The water and light sand and clay drop off and as the shelf is rotated to above a horizontal position,

the material on the shelf slides down (longitudinally of the "can") to the inside of the 4-ft. cylindrical screen at the

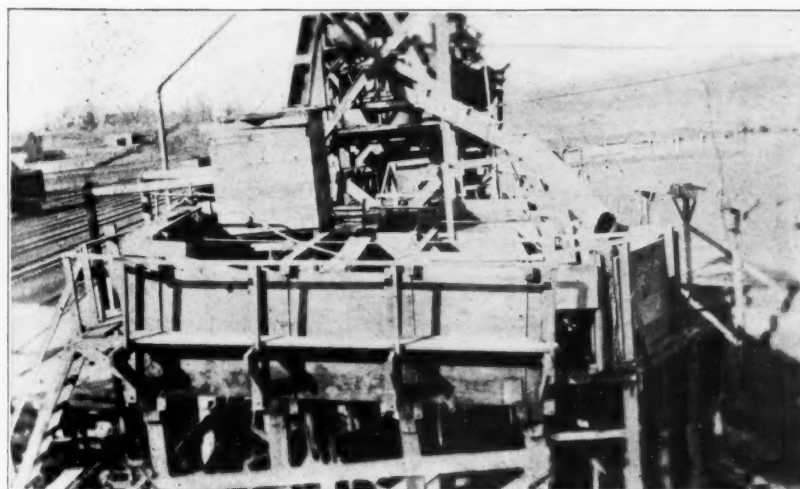
end. As this works out, it is separated at the $\frac{1}{2}$ -in. point. All over $\frac{1}{2}$ -in. falls into a small car on an elevated track



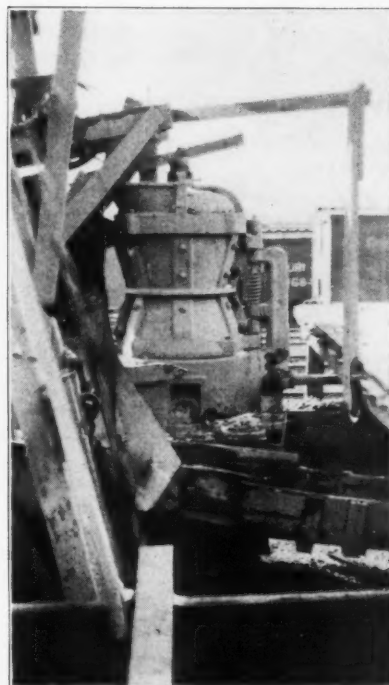
Pug mill for scrubbing clay loose from phosphate sand and gravel



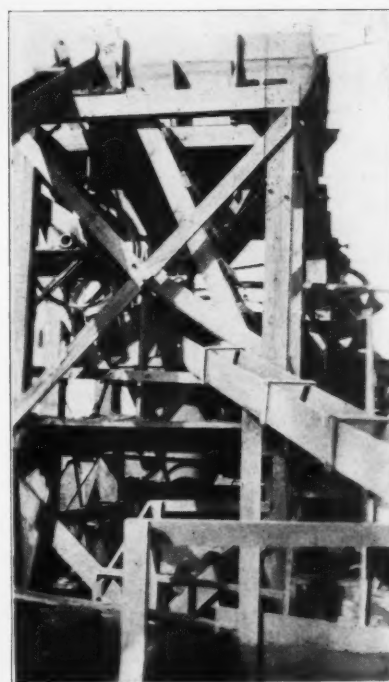
View of washers showing method of feeding rotary "can washers"



Riffles for recovering some of the fine phosphate sand



Crusher used for reducing rock and pebble phosphate for the mills which grind the material for direct application to the soil



Settling box with Allen cone separator below for recovering the 200-mesh phosphate sand

which delivers the material to the kiln room.

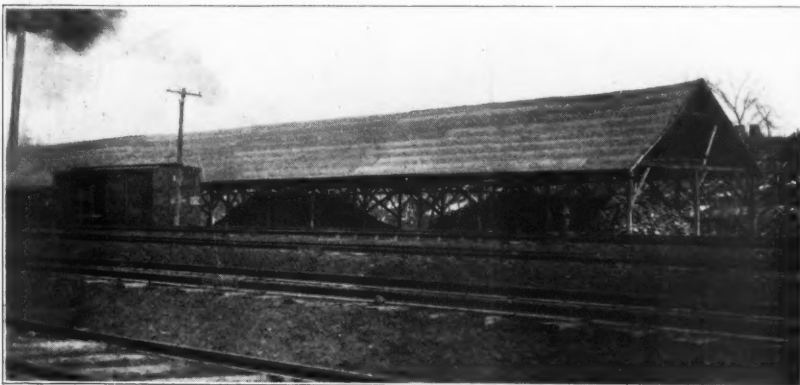
Drying the Stone

In the kiln room this material is piled on a layer of wood several feet thick and when sufficient has accumulated the pile is "burned." The product is called "burned lump rock," which is shipped to manufacturers of acid phosphate. This dry lump rock will run 75 to 80 per cent B. P. L.

The material passing the 1/2-in. screen is chuted to a car which takes the material to the grinding plant.

Washing the Fine Material

The finer sand, clay and water stays in the washer and because of cleats on the inside the material is rolled and washed thoroughly, and finally runs out of the feed end again to the settling boxes. Here by flowing over several riffles the phosphate sand in the overflow is allowed to deposit and the fine silt and clay pass on with the water.



"Kiln" building, where piles of rock phosphate are dried out by wood fires

These riffles are of the intermittent-flow type and are made in pairs. After the mixture has flowed through one set till there is considerable phosphate deposited, the

flow is changed to the other and the phosphate sand which has deposited is washed down into a sump with clear water. A steel pan and belt elevator, removes the phosphate sand and water to a separator box where the sand is separated from the clean water.

The overflow of this settling box is sent to an Allen cone separator where a still finer separation is made; that is, the phosphate as fine as 200-mesh is separated from the water.

After the phosphate sand and water has passed through the three settling boxes it is turned into a flume which has a 50-ft. riffle in it. Here still more of the very fine phosphate is removed and the water flows on into the waste. The phosphate sand collected by the last three processes is added to the heavier pebbles and sand in the cars going to the drying and grinding plant. A small gasoline driven centrifugal pump is used to force the waste water away from the plant to settling ponds where the water is cleared of silt and used over again.

The pebble material, the fine sand from the settling box and that from the Allen cone is loaded into a hopper-bottom railroad car and delivered to the dust mill.

Fuller's Earth in 1919

ABOUT 106,000 short tons of fuller's earth, valued at \$2,000,000, or \$18.87 a ton, was produced in the United States in 1919, as shown by preliminary returns made by the producers to the United States Geological Survey, Department of the Interior. These figures are the highest yet recorded by the Geological Survey, and show an increase of 217 per cent in quantity and of 563 per cent in value in 10 years. The increase in quantity in 1919 compared with 1918 was 25 per cent and the increase in value was 74 per cent. The average price per ton increased from \$13.57 in 1918 to \$18.87 in 1919.

Florida, which has long been the leading producer, made nearly nine-tenths of the output in 1919.

The imports of fuller's earth in 1919 were 13,873 short tons, valued at the port

of shipment at \$189,711, or \$13.67 a ton, an increase of 10 per cent in quantity and of 15 per cent in value compared with those in 1918.

Gypsum Production in 1919 Shows Increase

ABOUT 2,430,000 SHORT TONS of crude gypsum was mined in the United States in 1919, an increase of 373,000 tons over the output of 1918, according to estimates made by R. W. Stone, of the United States Geological Survey, Department of the Interior. This increase presents a striking contrast to a decrease in 1918 from 1917 amounting to 24 per cent, though it falls short of bringing the total production up to that of two former years—1912, when the output was about 2,500,000 tons, and 1916, when it was more than 2,750,000 tons.

The largest proportionate increases were made in Iowa, Kansas, and Ohio. The production in New York and Oklahoma remained almost stationary. Texas made a gain of 12 per cent after having suffered a loss of 39 per cent in 1918.

Of the 2,430,000 tons mined, about 510,000 tons were sold crude. Most of this, or 474,000 tons, was sold to Portland cement works at an average price of \$2.80 a ton as compared with 403,000 tons in 1918 valued at \$2.41 a ton. Sales of agricultural gypsum decreased from 64,000 to 36,000 tons, but the average price rose from \$3.96 to about \$5. The average price of all gypsum sold crude was about \$2.95 a ton as compared with \$2.63 in 1918.

About 1,397,000 tons of stucco, plaster of Paris, wall plaster, and Keene's cement was made from calcined gypsum in 1919 and sold at an average price of \$8.27, as compared with 1,174,359 tons in 1918 at \$7.22 a ton. About 195,000 tons of calcined gypsum was used in making gypsum boards, block, and tile, an increase of at least 50,000 tons over 1918. The average price per ton for calcined gypsum sold for all purposes appears to have increased from \$7.70 in 1918 to \$8.66 in 1919.

In common with operators in many other industries, manufacturers of gypsum have had much difficulty in making shipments because of the inadequate supply of freight cars.

Crude gypsum mined in the United States, 1918-19, in short tons.

State.	1918	1919 (estimate).	Increase or decrease in quantity mined (per cent).
Iowa.....	327,927	432,000	+32
Kansas.....	51,958	78,000	+42
Michigan.....	286,768	337,000	+18
New York.....	531,030	573,000	+8
Ohio.....	199,456	251,000	+28
Oklahoma.....	126,208	120,000	-5
Texas.....	157,358	176,000	+12
Wyoming.....	41,877	52,000	+24
Other States ^a	331,395	406,000	+23
	2,057,015	2,430,000	+18

^a Includes Arizona, California, Colorado, Montana, Nevada, New Mexico, Oregon, South Dakota, Utah, and Virginia.

A Side-Hill Cement Plant

Novella Cement Company of Guatemala, C. A., Has Unique Layout for Economical Operation

OUR PROPERTY consists of about 400 acres of land just outside Guatemala, which is the metropolis and capital of Guatemala, R. de G. C. A. Guatemala is a city of about 140,000 population and lies well up in the mountains about at 5,000 ft. elevation, where the tropical heat is not felt. In fact it is perpetual spring.

The property contains a very high grade limestone, clay and a volcanic ash called "tuffa," which are all excellent cement materials. We, however, use the volcanic ash in place of the clay, as it is nearer the mill and much easier to handle.

The property contains a magnesium limestone which makes a high grade lime. The company also operates lime kilns and a crushing plant to produce building stone and ballast and fertilizer lime. The fuels used are Mexican crude oil for cement burning and drying, and wood and oil for lime burning.

Wood-burned lime seems to be the most in demand and brings a very high

By Chester J. Pegg
Manager, Novella Cement Co.,
Guatemala, C. A.

price. Our cement plant is almost entirely a gravity proposition as shown by sketch, is operated with very little power and consists of the following equipment:

Cement Plant Equipment

Two 11x22-in. Climax jaw crushers.

One 5x55-ft. Bonnot rock dryer.

One 4x80-ft. Bonnot tuffa dryer.

Round steel storage tanks for dried rock and tuffa.

One Fairbanks hopper scale for raw mix.

One belt conveyor from mix scales to ball mill hopper.

Two Krupp ball mills for preliminary raw mix.

One 5x22-ft. Gates tube mill for raw mix.

One 7x90-ft. Ruggles-Coles rotary kiln.

One vertical steel clinker cooler.

Three 30-in. Griffin mills for preliminary clinker grinding.

One Fairbanks clinker and gypsum measuring device.

One 5x18-ft. West tube mill for finishing clinker.

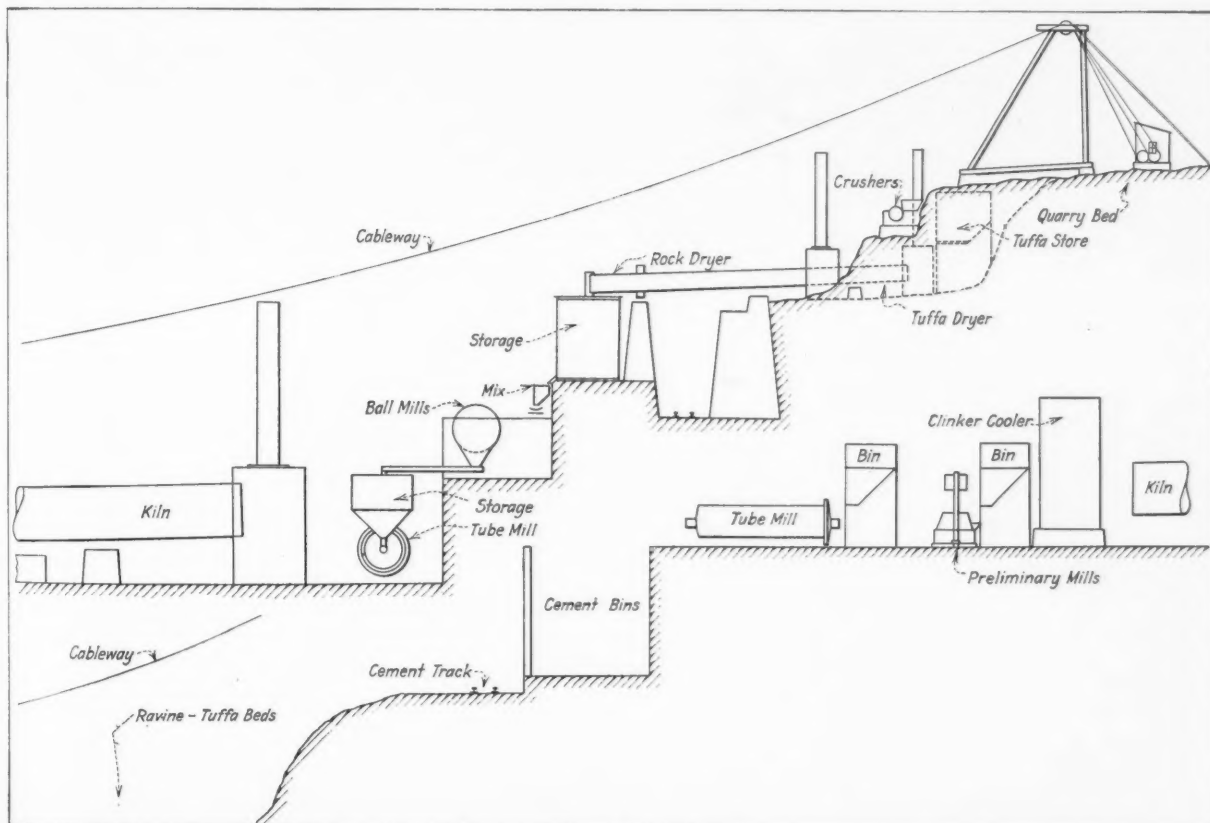
One double-drum, motor-driven, Flory cableway for carrying volcanic ash from ravine to mill.

Cement is packed in automatic bagging machines recently installed. Quarry stone is loaded by hand and brought to crushers in Koppel steel dump cars.

At present our power is bought from a hydro-electric company, but we are developing a hydro-electric property of our own in the mountains where about 2,000 k. w. are available.

The plant is individual motor driven with three-phase, fifty-cycle, 1,000-volt induction motors.

Our fuel oil is shipped from Mexico in



Sketch layout of the Novella Cement Co. plant, Guatemala, C. A. (not to scale)

tank steamers to Puerto Barrios, the Atlantic terminal of the railways, then to Guatemala in tank cars. The oil and mineral fields of Guatemala have not been opened up yet to any great extent.

Our gypsum which is very pure is brought from the Mexican and Honduras border. The plant only started producing cement in 1918 and it has proved to be the very best quality. The plant now

produces about 200,000 bbls. per annum.

The plant is of course complete with auxiliaries such as conveyors, elevators, oil pumps, air compressors, repair shops and oil burning locomotive for switching.

Mix Control--Dixie Cement Plant

Dry Ground Raw Materials and Special Slurry Feeding System

AT THE PLANT of the Dixie Portland Cement Co., Richards City, Tennessee, the wet process is used. The method of controlling and feeding the mix has some unusual and interesting features. The raw materials are shale and limestone.

When delivered to the cement plant, the material is stored in large concrete bins, placed in two rows. There are two shale and two limestone bins. From the bottom of each of these bins, the material is fed to belt conveyors—the quantity being controlled by table feeders and governed by an analysis of the material.

These belts convey the material to a battery of Williams mills where a further mixing is effected and the preliminary grinding is done. The combined product is delivered to one of two dryers where the proportioned limestone and shale is prepared for pulverizing. The raw

grinding is done in a battery of 30-in. Griffin mills.

The product of the Griffin mills is elevated by an inclined belt to a pug mill. Here the dry material is agitated as it is mixed with water until it is a thick paste, which is ground in a battery of tube mills. Ten small preliminary slurry tanks are provided for the finished slurry.

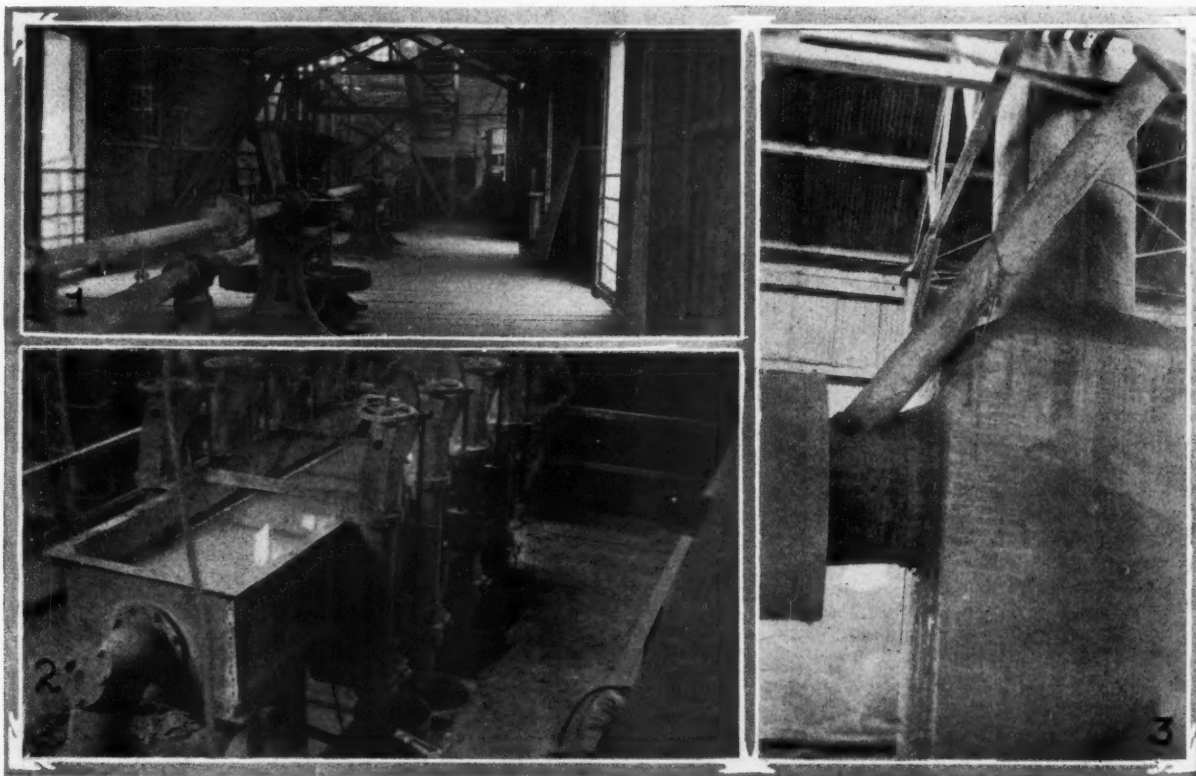
Two 1000-bbl. capacity tanks enable a mixture of two or three of the preliminary tanks. The ten small tanks are analyzed and then pumped together into a larger one so as to give the desired mix. Several centrifugal slurry pumps are used to shift the material.

The slurry is fed to the kilns by gravity from a special feed tank. One of the views will show the feed tank as it appears in operation. There are eight kilns and each kiln has a separate pipe to this tank and the quantity of material fed into each kiln is regulated by a valve. The

feed tank is about 25 ft. above the kilns and in the rear about in the plane of the stacks so that the feed pipes to the kilns are almost vertical.

The feed tank is open on top and there is a separate pipe to each kiln so that the quantity being fed into any kiln is easily regulated. A man is stationed on the platform where he can regulate the feed so that it is always constant and keep the pump from overflowing the tank. The tank is small so that the material flows through it so quickly that there is no chance for it to settle or vary in mix. Samples of the feed are made at frequent intervals and so a final check of the material is obtained.

The feed pipe enters the kiln through a round section of smaller diameter than the kiln itself, which fits in at the end of the kiln between the rotary part and the stack. One of the views shows how the feed pipe connection is made.



(1) Slurry tanks and agitators; (2) Kiln-feeding slurry tank; (3) Kiln-feeding device

Rock Fertilizers Meeting

Gypsum Industries Association Meet With Other Rock Fertilizer Interests to Form Joint Association

A MEETING OF THE SECRETARIES OF ROCK FERTILIZER associations and other interested parties was held in Chicago, September 8, under the auspices of the Gypsum Industries Association, to talk over and consider the mutual relationship of rock fertilizers, and to consider the combining of these interests into one permanent organization. The meeting was only preliminary to one which will be called later on, and the proceedings were carried on on rather informal lines.

C. A. Tupper, of Chicago, Ill., who acted as temporary chairman of the meeting, made the introductory address, laying stress upon the importance of ground rock fertilizers, and the benefit that the interests would derive from an association that would be composed of different interests or associations of ground rock fertilizers.

H. H. MacDonald, secretary of the Gypsum Industries Association, who acted as temporary secretary of the meeting, read several letters that had been received from such interests as the International Harvester Co., Southern Agricultural Lime Association, National Lime Association, Union Trust Co., of Chicago, assuring their co-operation and help in the new project.

A paper by H. B. Brookley, of the United States Gypsum Co., on the "Basis of Soil Fertility," was read by Secretary MacDonald, owing to Mr. Brookley's absence. The paper showed quite conclusively the need of a permanent organization, and how it could be effected. In the discussion of Mr. Brookley's paper, the need for co-operation and educational work was brought out especially.

System of Fertilizers

Dr. Wm. Crocker, of the University of Chicago, who is agricultural advisor to the Gypsum Industries Association, read a very interesting paper on "Natural Rock System of Fertilizers." The paper brought out the scientific facts of the fertilizers and touched upon the work of the agricultural experimental station in the State of Oregon on gypsum as a fertilizer. It emphasized the need of a system of fertility such as practiced in Illinois. Due respects were paid to the late Dr. Cyril G. Hopkins, head of the Illinois Agricultural Experiment Station, who was the originator of the "Illinois System of Agriculture—Lime, Phosphate and Legumes." Dr. Hopkins advocated the

use of rock phosphate instead of acid phosphate for Illinois soils, and thereby made it the richest agricultural state in the Union.

In the discussion of Dr. Crocker's papers, Davis Gray, of the Tennessee Agricultural Chemical Corporation, Columbia, Tenn., brought out the fact that the entire South was prejudiced and ignorant of fertilizers, and if any educational propaganda were to be started, and there is certainly need of it, that the South was the logical place to start.

Fineness

S. B. Kanowitz, of the Raymond Impact Pulverizer Co., Chicago, gave a very interesting talk on the fineness required by rock fertilizers. Mr. Kanowitz has made tests on the fineness of ground rock all over the country, and is a thorough exponent of the subject. He showed very decidedly that the chemical and physical characteristics of the rock should be known, before attempts at grinding are made. That his statements were well appreciated, was evidenced by the generous applause that he received.

W. Frank McClure, of the Fort Dearborn National Bank of Chicago, gave an impromptu talk on the effect that the banks would have on such an organization as that suggested. He told of the work done by the banks toward educating the farmer, and showed the need of real co-operation.

Co-operation Needed

F. B. White, of the Agricultural Publishing Association, who is recognized as one of the foremost organizers of the country, gave a very interesting talk on the need of greater co-ordination on the part of the interests. He said that organization needs three things, namely, inspiration, perspiration, and conciliation. He showed that there is danger in delay, and urged that the proposed organization be effected, while the enthusiasm waxed hot. Among other things he urged the doing away of the competitive idea, and adoption of the co-operative idea—"United We Stand, Divided We Fall."

Bert Ball, of the National Crop Improvement Service, followed Mr. White, and brought out the need of a complete scientific department. Mr. Ball maintained that the organization should have as little college blight as possible, because of the fact that college men work too much to a preconceived idea. He

also stated that one of the best ways to educate the farmer to the use of fertilizers is through the Federation of Farm Bureaus, through which, as a clearing house, the proposed organization could distribute its propaganda.

George Thomson, of Thomson Phosphate Co., Chicago, Ill., made a resolution that steps be taken to effect a permanent organization, and that the temporary chairman continue in that capacity until officers were elected. This motion was seconded, and the chairman stated that proper committees would be appointed to formulate an organization, and that another meeting would be held sometimes in January, where permanent officers would be elected. With this the meeting was adjourned, until 1:30 p. m., when the general session would start again.

General Discussion

With the opening of the meeting in the afternoon, E. H. Favor, Chicago, Ill., emphasized the need of fertilizers by fruit growers, and urged concentrated action in that direction by the proposed organization. He was followed by Mr. Gray, who in a discussion on shipping said that it would be impractical to make shipments from mines to reduction points, as it costs just as much to ship the prepared fertilizer as the raw product.

J. H. Prost, of the agricultural extension division of the International Harvester Co., made a short but effective talk on the unselfish and interested work of his company in educating the farmer. He again brought out the fact that the best way to spread the gospel of fertilizers was through agricultural experiment stations and rural farm bureaus.

Claude Clark, assistant secretary of the National Limestone Association, brought out the need of fertilizer storage bins, and submitted a bulletin on same, issued by the Jeffrey Mfg. Co., of Columbus, O. This aroused very much interest, and Secretary MacDowell promised that every one registered would receive a copy of the bulletin.

In summing up the whole meeting, Charles Henning stated that all interested in soil fertility were here as component industries. He emphasized the fact of balanced rations in soil fertility, and he urged that the enthusiasm should not be allowed to die out.

A list of those registered at the meeting is given on page 57.

State of Texas Would Build Cement Plant

College Professor as an Expert on the Costs of Manufacturing Portland Cement

AUSTIN, Texas.—With no sign of early improvement in the cement situation in Texas the agitation in favor of the State building and operating a plant for the manufacture of the material is growing. At the last special session of the Legislature a committee of members was appointed to investigate the question of the State entering into the manufacture of cement and to report at the coming regular session which is to meet next January. In addition to this legislative investigation the Texas Road Builders' Association, through R. G. Tyler, president, has appointed a committee to make a similar investigation. This committee is composed of Prof. F. E. Giesecke, Austin, chairman; D. D. Panas, Houston; R. J. Potts, Waco; J. M. Howe, Houston, and R. V. Glenn, Fort Worth. There are at present five cement manufacturing plants in Texas and according to builders and contractors these concerns are entirely inadequate to the demand for the material. Big quantities of cement are now being shipped to Texas from Oklahoma, Kansas and other States. Efforts have been made to purchase cement from mills as far away as San Francisco, but without success.

Dr. J. C. Nagle, dean of the Department of Engineering of the State Agricultural and Mechanical College, who has gone to considerable trouble to investigate the cement shortage and the possibilities of the State engaging in the industry of manufacturing the material, unhesitatingly says that there is room for another cement mill in Texas. He points out that the annual demand for cement in this State in ordinary building activities is about 2,000,000 bbls., and that an additional 1,000,000 bbls. are needed for highway construction. The total capacity of the cement mills of Texas is about 500,000 bbls. short of the present annual demand of the State and this shortage will become greater as the building development increases. In a report on the subject of a State-owned cement plant Dr. Nagle concludes as follows:

"The cost of producing a barrel of cement will depend upon a number of factors, among them location, cost of mining, combining and grinding the raw materials, the type and size of plant, kind and availability of fuel etc. Probably the smallest size plant which can be economically operated is one of 1,000 bbls.

per day capacity, or, say, 300,000 bbls. per annum. Suitable limestone and clay in close proximity can be found in a large number of localities in Texas, but the question of railroad facilities for shipping in fuel and shipping out the cement must be given due consideration in selecting the site. Also the proximity to the place of probable maximum consumption should also be considered.

"The cost per barrel, at the factory, would be about \$2.13. For an average train haul of 100 miles, assuming a two-line haul, the freight would amount to 60 cents per barrel, making the total cost, on board cars at point of delivery, \$2.73 per bbl. It has been practically impossible to secure firm quotations recently, but about two months ago I had tentative mill quotations for July delivery of \$4.07 per bbl. If the value of the sacks be \$1 per bbl., this leaves \$3.07 for the cement, but the mill reserved the right to bill out at the market price at time of delivery. I have been informed of other quotations comparatively recently of \$3.17 per barrel. This would indicate that the profit per barrel probably ranges from 34 to 45 cents, if \$3.50 oil is used in its manufacture. Until quite recently our Texas mills were operating with much cheaper oil.

"In the estimate of the cost of operation, fuel is the largest single factor in the case. If cheaper fuel than oil at \$3.50 per bbl. is obtainable, or if a smaller quantity than one-third of a barrel of fuel per barrel of cement can be secured, a corresponding decrease in the cost of production will be effected. By reference to the quotations from the reports of the United States Geological Survey, it will be seen that the factory prices during 1919 averaged \$1.69 for the whole United States and that the lowest given for any State was \$1.57 in Kansas, while the highest was \$2.03 for Utah. These figures would indicate that the computations given herein for Texas are about in line, because fuel and other costs are higher now than they were in 1919, on the average. By using ground coal or lignite for fuel, with the cement plant located close to the source of fuel, it is probable that the cost of producing a barrel of cement in Texas can be reduced to \$2 per bbl. or less, at the factory. It is believed that one-third of a barrel of fuel oil per barrel of cement is none too much to allow for a plant as small as the one under consideration.

"It has been suggested that convict labor could be used to advantage in quarrying and for such other work as does not require skilled labor. There are so many angles to such a use of convict labor that arguments on the question will not be attempted here. A dependable and sufficient supply of common labor at reasonable living wages will do much in the way of reducing production costs however.

"Such a plant as we have been considering would not suffice to relieve the deficiency in our Texas supply altogether, but it would help, and if found to be more than self-sustaining it could be enlarged or an additional plant could be built and operated. On the basis of 34 cents per barrel profit the net earnings on 300,000 barrels per annum would be \$102,000, and on a basis of 45 cents profit these earnings would be \$135,000. The principal effect of a State-owned plant would, however, lie in its wholesome tendency to stabilize market prices and reduce fluctuations which, when excessive, are hurtful to both producer and consumer."

Million New Motor Cars Add to Road Wear

THAT THE PRESENT INTEREST in the construction of new highways should not divert attention from properly maintaining highways already improved is a point which the Bureau of Public Roads, United States Department of Agriculture, has had occasion to emphasize many times in recent months, particularly in view of the enormous increase in motor vehicle traffic which is taking place. The bureau recently completed a compilation of statistics from all the States of the Union showing that there were a total of 7,565,446 registered motor cars (including motorcycles and trucks) in the United States in 1919. This is an increase of 23 per cent, or 1,418,829 motor cars over 1918. Such figures indicate that the country's highways are being used far more than in the past, it is pointed out, and in consequence added attention must be given to the repair problem. The increase in the number of cars for 1919 over 1918 represents about 10 per cent more cars than the total number registered in the entire United States for 1913.

Additional use of roads and streets has, of course, been accompanied by additional revenue paid to State and local governments in the form of license fees, which in nearly all States are devoted to highway needs. The registration and license fees for automobiles, trucks, and motorcycles in use in 1919 totaled \$64,697,255.58—an increase of 20 per cent over 1918. The total revenues for New York and Pennsylvania the past year were about double the revenues received for all motor vehicle registrations and licenses in the entire United States in 1912.



Editorial Comment



Commencing September 14 at Louisville, Ky., there will be a series of meetings of local sand and gravel producers at this and various other Southern cities, including Knoxville, Tenn.; Asheville, N. C.; Macon, Ga.; Birmingham, Ala.; New Orleans, La., and Memphis, Tenn. These meetings are to be held under the auspices of the National Association of Sand and Gravel Producers, and they should arouse the keenest interest and have the most loyal support of all producers.

Every reader is familiar with the work this association has done to bring the significance and the importance of the industry to the attention of the public and the government. Of course not all has been accomplished that it was proposed to accomplish and many operators have not yet seen any tangible results of the long, hard fight that has been made in the matter of car service and freight rates. Nevertheless, very great progress has been made and there is every prospect of getting results that will be of tangible and direct benefit to every single producer if the fight is continued; and success is practically assured if every operator will do his fair share.

The management of the National Association of Sand and Gravel Producers is in the hands of loyal, earnest men, who have not hesitated at any sacrifice of their own personal convenience, time, money or effort to carry forward the fight for recognition of the sand and gravel production as one of the basic industries of the country. Every operator who has faith in his commodity, its importance and its future, should give the National Association his fullest support, and he should be grateful to it for bringing about these local meetings and the organization of local associations.

The soil of the earth is composed of disintegrated rocks. The virgin fertility of different soils depends largely on the kind of rocks from which the different soils were formed, leaving out of consideration such things as moisture and drainage, etc., that can ordinarily be provided for.

In any mass of broken-up rock that forms the foundation of the soil, more than half is of such substances as quartz (silica) which are useless to plants. The quartz serves, however, as a useful carrier of other minerals like lime, phosphate soda, potash, sulphur, etc., that the plants do use. The cropping of fields tends to remove all of the useful minerals and leave behind the silica quartz or sand, which eventually would make only a barren waste.

Moreover, as soon as land is plowed and the soil exposed to rain, snow, ice and to the action of the wind,

it begins at once to deteriorate and to be carried away from the fields into streams, to be eventually deposited in the bottom of the sea, while the minerals necessary to plant life go into solution in the sea water. Under ordinary methods of farming, land is completely worn out in from 100 to 200 years of constant cultivation.

Rock product fertilizers came into use many years ago in the form of lime, and in the eighteenth century ground limestone was discovered to have much the same properties in the soil as burned lime, and has since been used in increasing quantities. About the same time that ground limestone had begun to be used in England and Scotland, ground gypsum rock or land plaster was tried in America.

In the meantime guano from South America was imported into England and America and the value of phosphate fertilizers was thus made known. As this material increased in price it came to be diluted with ground bones and other former waste products.

The modern commercial fertilizer industry is divided into two main groups, one of which derives its principal raw materials from natural rock products and the other from the waste products of various industries, the chief of which is of course the slaughter-house and meat-packing industry. The latter was long in the ascendancy and so powerful was its influence and propaganda that the rank and file of farmers still believe that a fertilizer must have a vile odor in order to be effective.

For a long time the promotional activities of the fertilizer industry completely overshadowed the good to be derived from the use of lime and limestone. But in very recent years the true function of lime, when used in connection with crops of clover and legumes, has come to be generally known and some of the principles of permanent soil fertility have been developed.

This has led to the extensive use of ground raw rock phosphate and a return to the use of ground gypsum rock, or land plaster, to furnish the mineral elements other than the calcium of the lime, required by plants. Likewise, the practice has grown in the South of grinding and pulverizing a slate rock high in potash. These materials furnish the calcium, phosphorus, sulphur and potassium in the state they are found in all naturally rich soils.

Notwithstanding this last fact commercial fertilizer manufacturers and many agricultural experts have contended that minerals in this form are unavailable for plant food and must be artificially prepared to make them soluble. In spite of their efforts, ground rock fertilizers are being more and more used, a few scientific men have now become interested in them, and it is beginning to look as if *rock product fertilizers* are the proper thing to use where *permanent soil fertility* is the ultimate goal.



Conveyor Hazards and How To Minimize Them

(Prepared for "Rock Products" by the engineering staff of the National Safety Council)

THIS IS THE THIRD of a series of articles on conveyor hazards begun in the Aug. 14 issue of ROCK PRODUCTS.

Belt Conveyors

It is important that the driving mechanism of belt conveyors be properly safeguarded. The conveyor belt and trough should also be railed off or otherwise protected so that workmen will not attempt to cross over or ride upon it.

Loading Hoppers

Loading hoppers are ordinarily supplied as a part of belt-conveying systems used for handling cement, crushed rock, coal, etc. By the use of loading hoppers, there is less wear on the belt because the material is fed gradually over a space of several feet of the belt. Loading into the hoppers is also less hazardous to the workmen because there is little danger of the material being thrown out by the moving belt. Where movable hoppers are used, care should be taken that the hoppers are securely and rigidly fastened in place so that there is no danger of any part of them coming in contact with the belt and an accident resulting.

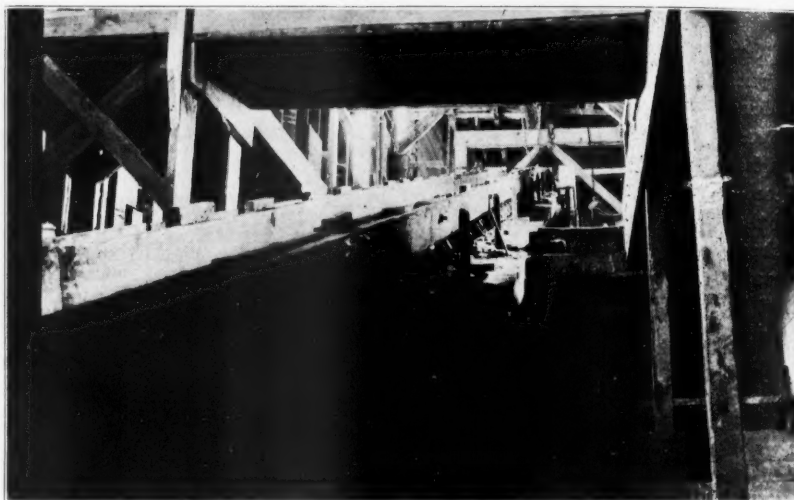
Discharging Trippers

Trippers or automatic discharging stations are frequently used with belt conveying equipment. Such trippers serve the purpose of emptying the belt of its load at the desired location. Workmen should be cautioned to use care in dislodging material which may become choked up in the chute of a tripper, and to keep away from moving parts.

Great care must be used in manipulating a self-propelled tripper because should the propelling mechanism be thrown into gear there is a possibility, unless the operator is attentive to the work in hand, that it will run to the end of runway and cause an accident. A device for throwing the propelling mechanism into neutral position should be provided at each end of runway.

Tension in Belt

Care should be taken that the working tension in a belt is not too great. This should not exceed 24 lbs. per inch per



Example of a well-built conveyor-belt installation

ply which is approximately 1/16 of the breaking strain of a belt. For temporary installations 36 lbs. per inch per ply may be used but this is the extreme limit at which conveyor belts should be operated.

Chain Conveyors

Chain conveyors are made in various types and to serve various purposes. Frequently, hooks are attached to the chain links and from these hooks the material is suspended. In another type the chain passes through the bottom of a trough and has attached to it at intervals lugs which serve to pull the material along in the trough. The return portion of chain or cables should be effectively guarded against contact.

Where the conveyors are in continual operation the conveyor should be railed off so that workmen cannot step upon it. Where it is necessary that workmen at times step upon the conveyor to load the material, the operator of the conveyor should always be in a position so that he can see the entire length of the conveyor. Under no conditions should he ever start the conveyor when a man is on it or until he has sounded a gong warning.

Flight Conveyors

Flight conveyors are in fact an adaptation of the chain conveyor, consisting essentially of a chain to which at regular

intervals are attached scrapers.
(To be continued)

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Italian Pumice-Stone Industry

(U. S. Consular Report)

Rare Rock Product—Its Source, and Preparation for the Market

PUMICE IS FORMED by the solidification of the foam produced on molten lava by the escape of gases. The internal structure of high-grade pumice is cellular and the specific gravity of the stone so low that dry pumice floats in water. While pumice is scattered over considerable areas of the world's ocean bed, the known deposits on dry land are not extensive.

The highest grade of pumice known to the trade is of Italian origin. The seat of the industry is the volcanic island of Lipari, one of the group of the Æolian Islands lying off the north coast of Sicily about 40 miles from the Italian mainland. The town of Lipari, with a population of 10,000 inhabitants, is said to be one of the most prosperous communities in Italy, as 90 per cent of the pumice mines belong to the municipality, and the city collects an export duty in normal times amounting to a total of not less than 300,000 lire annually.

Primitive Mining Methods—Grinding Not Satisfactory

The methods employed in pumice mining are primitive. The deposits for the most part are found near the surface, and the material is extracted by drifts projected only a few meters into the hillsides. The output could be considerably increased if these drifts were properly timbered so as to follow out the paying strata of pumice material. Without the use of props the danger of cave-ins is such that the mining drifts are abandoned long before their possibilities are exhausted.

Before the war the work in the mines was performed chiefly by convicts who had been sent to the island for petty misdemeanors. These men were free to go about as they choose during the day, but were locked up from sunset to sunrise. As they were allowed only a few cents per day for maintenance, they sought employment in the pumice industry, as there was nothing else on the island to give them gainful occupation. These men had no interest whatever in their work and, as grinders of pumice, turned out a very inferior article. During the war the convicts were sent to another island and the work has since been carried on with better results by the native islanders. Despite the higher grade of labor now employed, native-ground pumice is still considered an inferior article. This explains the fact that crude lump pumice commands a higher price

in the American market than that sorted and ground by the Italians.

Recognized Grades of Pumice—Exports

Roughly speaking, pumice is divided into three grades. (1) The crude material as it is taken out of the mine is known as "pumice chips" or "pezzame" and forms about 80 per cent of the total exports of the United States. (2) Italian powdered pumice is a product of the local mills and is handled in bags for the export trade. The Italian product is considered much inferior to American-ground Italian pumice. The bulk of the exports to Great Britain, France, and countries other than the United States is in this form, the United States being the only country where the crude product is imported and converted into pure powdered pumice. (3) Lump pumice varies from the size of an apple to that of a large cabbage. This grade is shipped in barrels and is used principally by carriage and automobile makers, marble workers, lithographers, platers, and manufacturers of patent leather and enamel.

The pumice trade was naturally interrupted by the war and exports dwindled. During 1919 the shipments of pumice from Lipari were greater than ever, the quantity and destinations being as follows:

	Kilos.
Mainland of Italy and Sicily.....	5,805,684
France	3,257,148
England	1,451,381
United States	7,531,693
Germany	198,369
Total	18,244,275

Exports are now rapidly increasing. It is understood that in the six months, January to June, 1920, one firm on the island of Lipari shipped 4,000,000 kilos (kilo equals 2.2046 lbs.) of pumice to the United States. There are about 20 firms on the island of Lipari engaged in the pumice export trade; and, being unorganized, competition among them is active.

Handicaps to Trade

It is seldom that an ocean-going vessel stops at Lipari to take on a cargo as the island possesses no harbor facilities. While occasionally consignments are lightered out to steamers on small barges, the bulk of the export shipments is handled through the port of Messina, on the island of Sicily. On vessels returning to the United States from the Adriatic and Black Sea ports advantageous rates may sometimes be obtained for nonperishable goods such as pumice.

If modern mechanical devices for min-

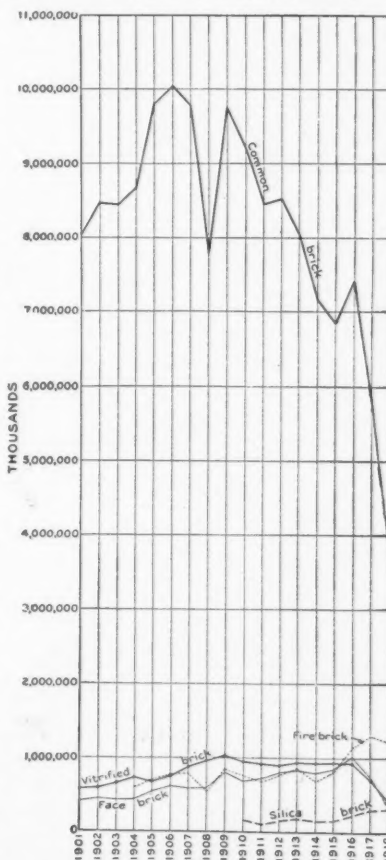
ing were employed and better methods adopted in the grading and preparation of the raw material for the export trade, a great expansion of the business might be reasonably anticipated. At the present time the industry is strictly localized and self-contained, and it is likely that American importers will continue to display a preference for the lump pumice.

What Concrete Has Done to the Clay-Brick Industry

THE DIAGRAM BELOW is a story without words—and not a cheerful story for the manufacturer of common clay brick. It shows how the brick industry started on the decline in 1909, and how steep the toboggan has been since then.

Of course the sharp decline since 1916 is in some measure due to general conditions which have caused a decline in the production of all building materials, but the general course of the diagram is bound to be downward notwithstanding.

The explanation of this decline is of course found in the tremendously expanding use of concrete, and now since concrete brick are an assured success—both for common brick and face-brick purposes, the future outlook of the clay-brick industry is none too promising.



How the production of clay brick has fallen off



NEW MACHINERY AND EQUIPMENT



A New Track-Scale

A NEW TRACK-SCALE embodying many new and exclusive features has been developed by E. & T. Fairbanks & Co., St. Johnsbury, Vt., manufacturers of the well-known Fairbanks scales. This was occasioned partly by new specifications adopted jointly by the American Railway Association, the American Railway Engineering Association and other organizations. These specifications make necessary such changes in the design of scales on the market up to this time that the new scales in accord with them are not interchangeable with the old scales. While changes were being made that were sufficient to destroy the interchangeability of the new and old scales, it was decided to go further and remove incongruities in design that were and have been present in scales ever since the first was built 90 years ago.

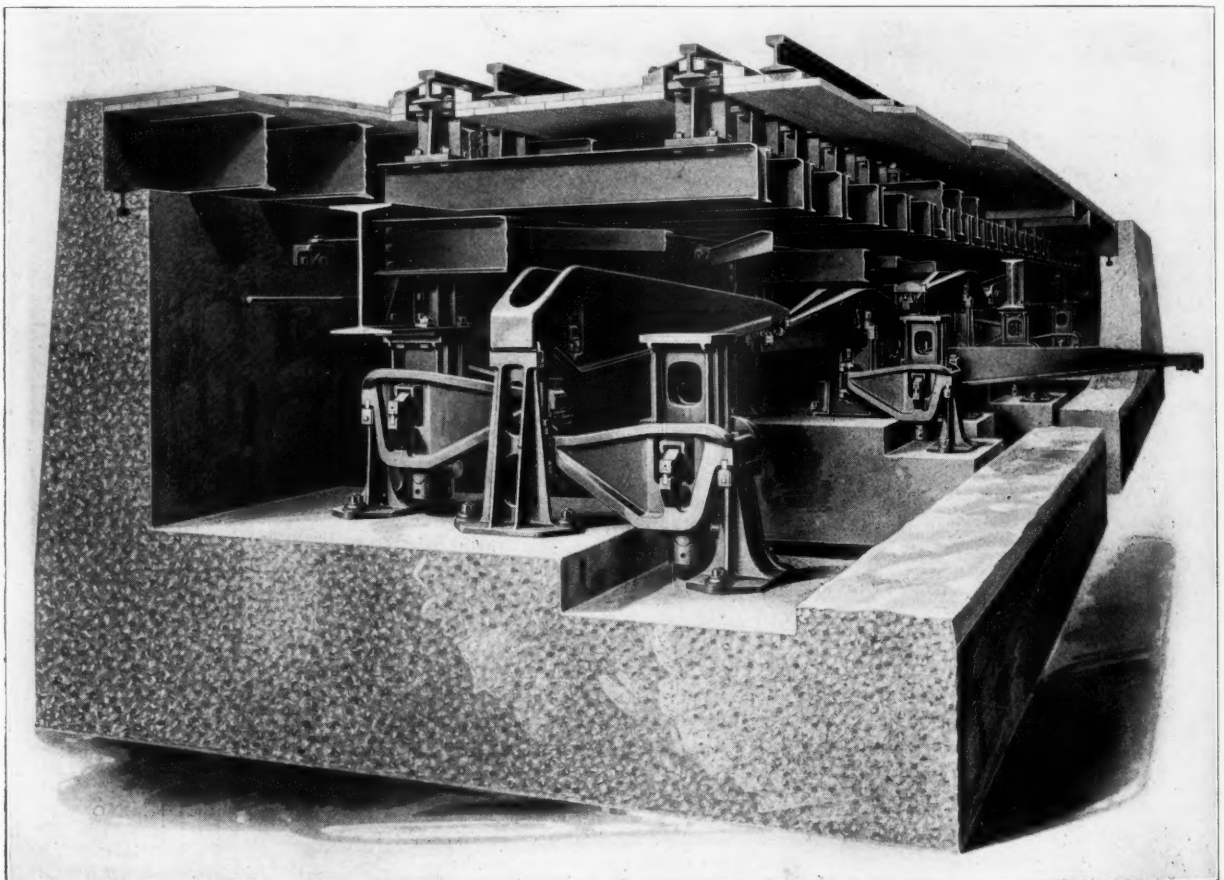
The scale is built in two capacities for

light-duty service, or service where only a relatively small number of cars is to be weighed. These have 60- and 75-ton sections and lengths of 50 ft., 56 ft. and 60 ft. effective weighing rail. For heavy service or where a large number of cars is to be weighed the scale will be built in 75- and 100-ton sections and in the same three lengths as above. The difference between the light-duty and heavy-duty scales is mainly in the loading per linear inch of knife-edge, this being 5,000 lb. in the heavy-duty scales and 6,000 lb. in the light-duty scales. The difference in allowable loading and the allowance of a higher multiple main lever in the light-duty scales serves to make somewhat lighter castings than are necessary in the heavy-duty scales.

The beam in keeping with the other parts of the scale is novel in design. A close study will reveal that this design includes well accepted principles essential

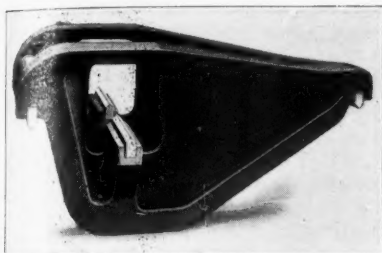
to an accurate and durable beam and the difference in appearance from the conventional type of beam is due to a consistent use of these principles. It is of cast-iron with cross-section of inverted-U shape. This shape, besides giving the maximum rigidity, furnishes a housing over the balance-ball and track for carrying the poise. The notches are cut in a steel bar inserted in the bottom of the back web, which insures that no dirt can fall and lodge in them. The type for printing weights on tickets is fastened on the bottom of the front web where it is protected from damage.

The center indicating poise suspended from three ballbearing trolley wheels runs smoothly upon a machined track housed inside the beam. Its exact weighing position is determined by a positive locking device of 30 or more teeth engaging the same number of notches of the beam. This locking device or pawl moves in

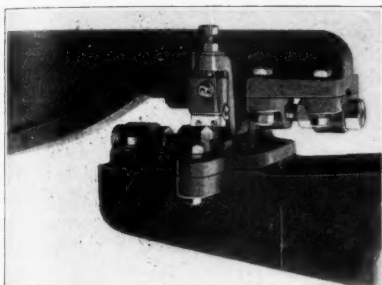


Construction of new Fairbanks track-scale

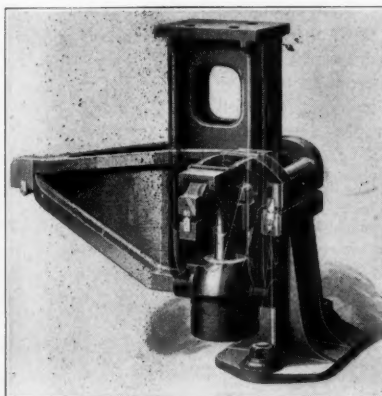
vertical guides arranged to be always tight, to insure a positive position of the poise. A convenient handle on the front of the poise serves to operate the pawl



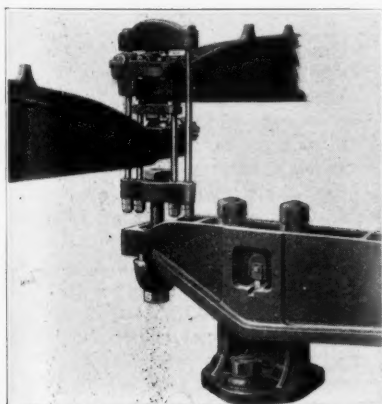
Main lever showing knife edges



Extension lever nose irons



Main lever assembly



Transverse extension lever connections

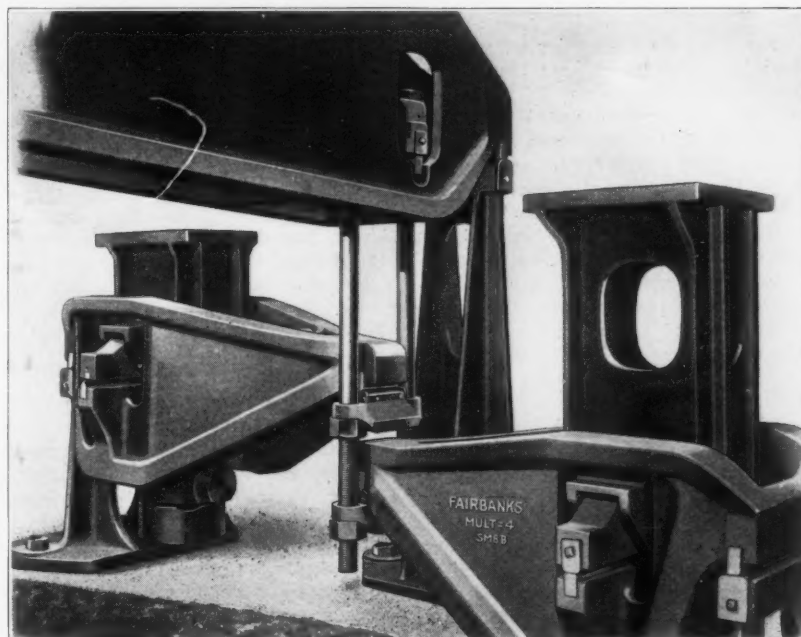
when turned in one direction and to print the tickets when turned in the other direction. The beam stand is of the upright pillar type with compensating steel bearing blocks machined in.

Standard erection plans have been drawn which incorporate the best recognized practice as to all details of installation. Wide pits afford ample room for installing the scale correctly as well as

for convenient examination from time to time. The design of the weigh-bridge, the mounting of dead-rail supports and fastening, the arrangement of weather guards, and all other details have been worked out carefully, with a view to obtaining the most economical way, consistent with accurate performance and at the same time the lowest maintenance cost.



Newly designed scale beam



End section assembly

General News from Rock Product Markets

Lime Association's Corrosion Test Results

THE SERIES of corrosion tests, which have lately been conducted in the National Lime Association laboratory to determine the effects of various materials used in construction upon reinforcing steel, have just been completed with interesting results.

A series of ten slabs of each of 14 different materials were made up, each slab having embedded in it two polished steel rods and each series being divided into two sub-series of five slabs each. One sub-series was stored in air only while the slabs of the duplicate sub-series were immersed in water for five-minute periods once a week during the conduct of the test. Slabs from each sub-series were broken and the extent to which corrosion of the steel rods had proceeded was noted at the following periods: one week, two weeks, one month, two months, and three months.

None of the concrete or lime mixtures showed any corrosion in either the air or water-treated slabs, but in series 7 to 10 inclusive, consisting of gypsum and hydrated lime—ranging from 100 per cent gypsum to 85 per cent gypsum and nothing to 15 per cent hydrated lime—some interesting results were obtained.

With 100% gypsum, air-cured, the test specimens showed a visible corrosion at the end of one week, which apparently reached a maximum in about one month due to the protective coating of iron oxide formed.

With 100% gypsum, water-dipped, the test specimens showed a greater corrosion than the air-cured slab, and this kept increasing throughout the time of the experiment.

With 95% gypsum and 5% hydrate, air-cured, the test specimens showed no corrosion at the end of three months, while the water-dipped slab showed noticeable corrosion at the end of two months and visibly increased corrosion at the end of three months.

With 90% gypsum and 10% hydrate, air-cured, the test specimens showed no corrosion, and the water-dipped sample showed none at the end of two months but very evident corrosion in three months.

With 85% gypsum and 15% hydrate, the test specimens showed no corrosion in either the air-cured or water-dipped slabs at the expiration of the three-months test.

These results indicate that, for purposes of preventing the corrosion of reinforcing steel, lime has a proper place in gypsum construction, the amount of lime to be used depending upon the probable amount of exposure to moisture

to which the construction may be subjected.

The Association is now considering plans whereby a comprehensive and complete investigation of this subject may be undertaken so as to determine accurately the proper place of lime in this connection.

Ohio Gives Priority to Road Building Materials

Immediate priority to the transportation of road building materials and machinery is to be given by all Ohio railroads, according to an order issued by the Ohio Utilities Commission. This action was taken to speed up the road construction of the state so that it can be completed before winter. Cars must be assigned forthwith in order that requests for road building materials can be filled promptly and the work of highway improvement pushed with all possible speed. It is the opinion of A. R. Taylor, Ohio Highway Commissioner, that the welfare of the 6,000,000 people of the state depends on the improvement of the roads before winter. More than \$1,000,000 is now available for such work, and all that is needed is the material. The roads which are in the worst condition and are needed more than others will be taken care of first.

Silica Brick Made in 1919

THE QUANTITY of silica (refractory) brick produced in the United States in 1919, according to an estimate made by the United States Geological Survey, Department of the Interior, was the equivalent of 216,363,000 9-inch brick, and was valued at \$11,798,000, a decrease of 120,199,000 brick and of \$8,190,000 from 1918. The average price per thousand decreased from \$59.39 in 1918 to \$54.53 in 1919. The output in 1919, though much smaller than that in 1918, was much larger than that made in any year prior to 1916, and the value in 1919 was much larger than in any year prior to 1917.

A Striking Proof of the Value of Agricultural Limestone

MOUNT AYR, Iowa, July 16—A. F. Beck of Athens township has demonstrated the value of the use of commercial limestone on his farm. On a 20-acre field which had been farmed continuously for 25 years, and on which three unsuccessful attempts at seeding had been made, he applied a ton of commercial limestone to the acre with the result that he has just harvested a crop of clover which yielded one and one-half to two tons to the acre. That the limestone was re-

sponsible for the large yield was demonstrated by the fact that on strips left through the field without the application of limestone the yield of clover was very light.—Des Moines, Iowa, "Register," July 17, 1920.

Potash in Nebraska

THE MANUFACTURE of potash from the brine of Nebraska lakes is being revolutionized through processes recently placed in two big plants at Antioch. So far the brine potash has been sold for fertilizer. The new separation process will give a product that is 95 per cent pure and can be used as a chemical, according to R. B. Agge of Council Bluffs, Ia.

The new process will not only increase the selling value of the product, but will also reduce the operating costs by increasing the capacity of the plants. Production costs on the brine lakes have been high, but the potash has sold and is still selling as fast as it can be produced, due to the fact that the German article, which previously monopolized the American market, is not yet available.

American producers of potash, seeking tariff protection at the hands of congress, have now made good on their promise to lower production costs so as to compete with the Germans, if given only a comparatively small protecting differential and a little time to work out the right processes. Under the old procedure it was necessary to reduce the brine to a solid. Under the new process the refining is done during evaporation of the brine, by the subjection of a 40 per cent solution to varying degrees of temperature, crystallizing and precipitating potash, soda and other chemicals separately, the potash first.

Agricultural Chemical Earnings Show Increase

SURPLUS of the American Agricultural Chemical Company for the year ended June 30, after charges, Federal taxes and allowances for preferred dividends, was \$3,576,102, equivalent to \$11.18 a share earned on the \$31,979,400 outstanding common stock, according to a financial statement issued yesterday.

This compares with surplus of \$2,498,732, or \$7.89 a share on the \$31,655,200 common stock outstanding a year ago. Manufacturing profits after charges and taxes were \$9,093,130, an increase of \$1,057,276, while net profits before preferred dividends were \$5,281,562, an increase of \$1,122,892. Total surplus increased \$1,024,828, amounting on June 30 to \$18,105,306.

The Rock Products Market

Wholesale Prices of Crushed Stone

Prices given are per ton, F. O. B., at producing plant or nearest shipping point

Crushed Limestone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:						
Bound Brook, N. J.	1.80	2.25	1.40 per net ton, all sizes			
Buffalo, N. Y.	1.00		2.50	2.00	2.00	
Burlington, Vt.	1.75	1.75	1.75	1.50	1.50	1.50
Chaumont, N. Y.	1.80	1.80	1.80	1.65	1.65	2.00@2.25
Coldwater, N. Y.	1.45	2.50	2.40	2.00	1.60	1.45
Grove, Md.	1.00	1.00	1.00	1.00	1.00	1.00
North Leroy and Akron, N. Y.	1.00		All other sizes 1.50			
Utica, N. Y.	2.00	2.25	2.00	1.80	1.60	
Vernoy, N. J.						
CENTRAL:						
Alden, Ia.	1.00		1.50	1.45	1.45	
Alton, Ill.	2.50		2.00	1.75		
Buffalo, Ia.	.90	1.35	1.45	1.25	1.25	1.35
Chicago, Ill.	1.58	1.90	1.70	1.58	1.58	1.58
Cincinnati, Ohio		2.00	2.00	2.00		
Cleveland, Ohio		2.40	2.20	2.20		
Columbia, Ill.	2.15	1.90	2.00	2.00	1.90	1.90
Davenport, Ia.	1.50*	1.50*	1.50*	1.50*		
Dundas, Ont.	.75	1.50	1.50	1.35	1.25	1.25
Eden and Knowles, Wis.	1.20	1.20	1.20	1.20	1.20	1.20
Elmhurst, Ill.	1.00@1.25	1.00@1.25	1.00@1.25	1.00@1.25	1.00@1.25	1.00@1.25
Ft. Wayne, Ind.	1.60	1.90	1.90	1.80	1.60	1.60
Greencastle, Ind.	1.25@1.50	1.35	1.25	1.10@1.20	1.10	1.10
Hull, Canada	2.50	2.30	2.50	2.10	2.00	1.75
Illinois, Southern	2.00	1.50	1.50	1.50	1.50	
Kokomo, Ind.	1.15	1.25	1.25	1.20	1.10	1.10
Lanark, Wis.	1.25	1.25	1.25	1.25	1.25	1.25
Lima, Ohio	1.40	1.40	1.40	1.40	1.40	1.40
Linwood, Ia.	1.00		1.45	1.25	1.25	
Mansfield, Ohio	1.70	2.20	2.00	1.90	1.70	1.70
Mayville, Wis.	.95@1.00		1.20	1.20	1.20	1.20
Montrose, Ia.	1.25	1.80	1.80	1.70	1.70	
River Rouge, Mich.	1.25	1.50	1.50	1.50	1.25	1.25
Silesia, Ohio	1.00	1.50	1.30	1.20	1.00	1.00
St. Louis, Mo.	.60	1.60				
Stone City, Ia.	.80		1.60	1.80	1.40	
Toledo, Ohio, f. o. b. cars	1.85	2.10	2.10	2.10	1.85	1.85
Toronto, Canada	1.55	2.25	2.25	2.25	2.05	2.00
Winnipeg, f. o. b. cars	2.90*		3.25*	2.90*		
SOUTHERN:						
Brooksville, Fla.	1.50		3.00			
Cartersville, Ga.	2.50	2.50	2.50	2.75	2.75	2.50
Chickamauga, Tenn.	1.50	1.75	1.75	1.75	1.75	1.75
El Paso, Tex.	1.00	1.00	1.00	1.00		
Fort Springs, W. Va.	1.75	2.00	1.90	1.80	1.60	1.50
Garnett, Okla.	.65		1.75	1.75	1.60	
Mascot, Tenn.		1.50	2.00	1.50@2.00	2.00	
New Braunfels, Tex.	.60	1.75	1.75	1.50	1.50	1.50
WESTERN:						
Atchison, Kans.	.50		2.10	2.10	2.10	
Blue Springs and Wymore, Neb.	.20	1.95	1.95	1.85@1.90	1.75@1.80	1.70
Kansas City, Mo.	.60	2.00				
Duluth, Minn.	1.00	2.25	2.00	1.50	1.50	1.50
Terminus, Calif.		1.00			.90	

These prices include 90c freight

Crushed Trap Rock

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Bernardsville, N. J.	2.00	2.20	2.00	1.80	1.50	
Brantford, Conn.	.80	1.75	1.65	1.45	1.25	
Birdsboro, Pa.	1.40	1.90	1.80	1.60	1.40	1.40
Bound Brook, N. J.	2.10	2.30	2.00	1.85	1.70	
Dresser Jct., Wis.	.75	2.45	2.45	2.15	2.00	2.00
Duluth, Minn.	1.00	2.50	2.00	1.50	1.50	1.50
E. Summit, N. J.	2.10	2.35	2.15	1.80	1.85	
Glen Mills, Pa.	1.00	1.35	1.70	1.55	1.35	1.35
New Britain, Middlefield, Rocky Hill, Meriden, Conn.	60@1.00	1.60@1.80	1.60@1.80	1.40@1.50	1.20@1.30	
San Diego, Calif.		1.30@1.60	1.25@1.55	1.15@1.45	1.10@1.40	
Westfield, Mass.	.60	1.35	1.30	1.20	1.10	
Richmond, Calif.	.50		1.50*	1.50*	1.40*	

Miscellaneous Crushed Stone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Dundas, Ont.—Flint	1.10	1.10	1.10	1.10	1.10	1.10
Middlebrook, Mo.—Granite	4.00		2.00			1.50†
Portland, Maine—Granite	1.50			1.35	1.25	
Roseburg, Ore.		1.50	1.25	1.05	1.00	1.00
Stockbridge, Ga.—Granite	.50	2.00	1.90	1.75	1.75	
White Haven, Pa.—Sandstone	.85	1.20	1.40	1.20	1.20	1.20
Granite	1.25		1.50	1.50	1.50	

*Cubic yard. †Agr. lime. ‡R. R. ballast. §Flux. ¶Rip-rap. a 3-inch and less.

Agricultural Limestone

EASTERN:	
Coldwater, N. Y.—Analysis, 56.77% CaCo ₃ , 41.74% MgCo ₃ —70% thru 200-mesh, 95% thru 40-mesh; bags, \$5.00; bulk	3.25
Chaumont, N. Y.—Analysis: CaCo ₃ , 92 to 98%; MgCo ₃ , 1.51%—(Thru 100 mesh); sacks, 4.00; bulk	2.50
Grove City, Pa.—Analysis: CaCo ₃ , 94.75%; MgCo ₃ , 1.20%—(70% thru 100 mesh); 80 lb. ppr., 5.50; bulk	4.50
Grove, Md.—(50% thru 50 mesh); paper bags, 6.75; bulk	5.00
Hillsville, Pa.—Analysis, CaCo ₃ , 96% (70% thru 100 mesh); sacks, 5.00; bulk	3.25
Jamesville, N. Y.—68% thru 100 mesh; 95% thru 50; 100% thru 20. Sacks, 3.75; bulk	2.25
Syracuse, N. Y.—Analysis, 90% carbonates (50% thru 100 mesh, 90% thru 50 mesh); sacks, 3.50; bulk	2.75
Walford, Pa.—(70% thru 100 mesh; 85% thru 50; 50% thru 50; 100% thru 4); sacked, 4.25; bulk	2.75
West Stockbridge, Mass.—Analysis: Combined carbonate, 95%—33% thru 200 mesh; 66% thru 100; 100% thru 40. Bulk	2.85
Williamsport, Pa.—Analysis, CaCo ₃ , 88-90%; MgCo ₃ , 3.4%—(50% thru 50 mesh); sacks, 5.50; bulk	4.00
CENTRAL:	
Alden, Ia.—Analysis, CaCo ₃ , 99.16%	.80
Alton, Ill.—Analysis: CaCo ₃ , 96%; MgCo ₃ , 0.75%—50% thru 4 mesh	2.50
Bedford, Ind.—(95% thru 10 mesh) Analysis, CaCo ₃ , equivalent 98.5%	2.00
Belleville, Ont.—Analysis, CaCo ₃ , 90.9%; MgCo ₃ , 1.15% (45 to 50% thru 100 mesh; 61 to 70% thru 50 mesh); bulk	2.50
Chicago, Ill.—Analysis, CaCo ₃ , 53.63%; MgCo ₃ , 37.51%—90% thru 50 mesh	1.00
Columbia, Ill., near East St. Louis (½-in. down)	1.25@1.80
Ellettsville, Ind.—Analysis, Carbonate, 98%	2.00
Elmhurst, Ill.—Analysis, CaCo ₃ , 35.73%; MgCo ₃ , 20.69%—50% thru 50 mesh	1.25
Greencastle, Ind.—(Analysis, CaCo ₃ , 98%) 50% thru 50 mesh	1.75
Howenstein, O.—100% thru 10 mesh; 59% thru 50; 39% thru 100	2.75@3.00
Kansas City—(50% thru 50 mesh)	2.00
Lanark, Wis.—(90% thru 50 mesh) Analysis, 54%, CaCo ₃ , 44%, MgCo ₃ , 2.00	2.00
Marblehead, O.—(Analysis: CaCo ₃ , 95.33%) 100% thru 100 mesh, sacks, 5.25; bulk	3.00
McCook, Ill.—Analysis, CaCo ₃ , 54.10%; MgCo ₃ , 45.04%—100% thru ¼-in. sieve; 78.12% thru No. 10; 53.29% thru No. 20; 38.14% thru No. 30; 34.86% thru No. 50; 22% thru 100	1.50
Milltown, Ind.—Analysis, CaCo ₃ , 93.10%; MgCo ₃ , 3.20%—(70.8% thru 20 mesh)	1.65
Montrose, Ia.—(90% thru 100 mesh)	1.25
Piqua, O.—Analysis: CaCo ₃ , 82.8%; MgCo ₃ , 8.2%; neutralizing power in terms of calcium carbonate, 95.3%—50% thru 100 mesh; bulk, 3.50; paper sacks	5.50
Rockford, Ill.—Analysis, CaCo ₃ , 54%; MgCo ₃ , 42%	1.25
Stolle, Ill. (near East St. Louis on I. C. R. R.)—(Thru ¼" mesh) Analysis, CaCo ₃ , 89.61 to 89.91%; MgCo ₃ , 3.82%	2.00
St. Paul, Ind.—Analysis, CaCo ₃ , 85%; MgCo ₃ , 12%	1.50
Stone City, Ia.—Analysis, CaCo ₃ , 98% (50% thru 100 mesh)	.80
Toledo, O.—Analysis, CaCo ₃ , 52.72%; MgCo ₃ , 43%—(20% thru 100 mesh); 30% thru 50; 80% thru 100; 100% thru 5/32 screen	1.80
Whitehill, Ill.—Analysis, CaCo ₃ , 96.12%; MgCo ₃ , 2.50%—50% thru 100 mesh	2.25
90% thru 100 mesh	5.00

(Continued on next page.)

Agricultural Limestone

(Continued from preceding page.)

SOUTHERN:	
Cartersville, Ga.—Analysis: 96% combined carbonates—All thru 10 mesh with all dust in.....	3.00
Claremont, Va. (Marltime)—Analysis, 90.94% CaCO ₃ , 0.31% P., 1.36% Mg., 0.37% K.; bulk.....	4.50
100 lb. ppr. bags.....	6.00
100 lb. cloth bags.....	6.50
Dittlinger, Tex.—Analysis, CaCO ₃ , 99.09%; MgCO ₃ , .04%.....	2.00
90% thru 100 mesh.....	1.00
90% thru 4 mesh.....	
Grovia, Ga.—Analysis, CaCO ₃ , 95%; MgCO ₃ , none—50% thru 100 mesh.....	3.00
Hopkinsville, Ky.—Analysis, 94.6 to 98.1% CaCO ₃ —Bulk.....	2.00
Linnville Falls, N. C.—Analysis, CaCO ₃ , 53%; MgCO ₃ , 42%—50% thru 100 mesh; sacks, 4.50; bulk.....	3.00
Marion, Va.—Analysis, 90% CaCO ₃ —(50% thru 100 mesh).....	2.00
Memphis Jct., Ky.—(Analysis, CaCO ₃ , 95.31%; MgCO ₃ , 1.12%); average price, 1/4 in. down.....	2.00
Mascot, Tenn.—Analysis, CaCO ₃ , 52%; MgCO ₃ , 38%.....	
(80% thru 100 mesh).....	3.00
(All thru 10 mesh).....	2.50
(80% thru 200 mesh).....	5.00
Paper bags, \$1.50 extra per ton; burlap, 2.00 extra per ton.....	
Maxwell, Va.....	2.50
Mountville, Va.—Analysis, CaCO ₃ , 76.6%; MgCO ₃ , 22.83%—100% thru 20 mesh; 100 lb. ppr., 7.00; bulk.....	5.00
Ocala, Fla.—Analysis, CaCO ₃ , 98%—(75% thru 200 mesh).....	4.50
Tyrone, Ky.—Analysis, CaCO ₃ , 90%; MgCO ₃ , 4%—90% thru 4 mesh.....	1.75@2.25
Winnfield, La.—(50% thru 50 mesh).....	3.00
WESTERN:	
Cement, Calif.—50% thru 50 mesh.....	4.00
Colton, Calif.—Analysis: CaCO ₃ , 95%; MgCO ₃ , 1 1/4% (all to pass 14 mesh)—bulk, 3.50; bags.....	4.50
Sacks, 15c extra, returnable.....	
Kansas City, Mo., Corrigan Sid'g—50% thru 50 mesh; bulk.....	1.35
Terminous, Calif.—Analysis, 94% CaCO ₃ , 1.4% MgCO ₃ —(60% thru 200 mesh; 90% thru 100 mesh; 100% thru 40 mesh); sacks, 6.00; bulk.....	5.25

Miscellaneous Sands

Silica sand is quoted washed, dried and screened unless otherwise stated.

GLASS SAND:	
Berkeley Springs, W. Va.....	2.75@3.25
Bridgeton, N. J.—Washed, 2.50; dried.....	3.00
Cedarville and South Vineland, N. J.—Damp, 2.00; dry.....	2.50
Columbus, Ohio.....	2.50@3.00
Gray Summit, Mo.....	2.50@3.00
Guion, Ark.—Carlots.....	2.50
Hancock, Md.—Damp.....	2.60
Klondike and Pacific Mo.....	2.50@3.00
Mapleton, Pa.—Dry.....	3.50
Glass, damp.....	2.75
Massillon, Ohio.....	3.50
Millington, Ill.....	2.25@3.00
Mineral Ridge, Ohio.....	4.00
Montoursville, Pa.—Green, washed.....	2.00@2.75
Morgantown, W. Va.....	2.50@3.00
Oregon, Ill.—Large contracts.....	2.00@2.50
Ottawa, Ill.....	2.50
Pittsburgh, Pa.—Dry, 4.00; damp.....	3.00
Robinson, Md.—Washed, damp.....	2.00
Rockwood, Mich.....	3.00@4.00
St. Marys, Pa.—Green.....	2.50
Sands, Elk Co., Pa.—Selected, green.....	3.00
Thayers, W. Va.—Washed.....	3.00
Tygart, Ky.—Washed, not dried.....	2.60
Utica, Ill.....	1.75@2.50
FOUNDRY SAND:	
Albany, N. Y.—Core.....	1.50@2.25
Molding fine and coarse.....	3.00@3.50
Sand blast.....	3.75@6.00
Brass molding.....	3.00@3.50
Allentown, Pa.—Core.....	1.50@1.75
Molding coarse.....	1.50
Arenville, Ill.—Molding fine.....	1.90@2.25
Beach City, Ohio—Core.....	3.00
Furnace lining.....	3.00
Molding fine and coarse.....	3.00
Sand blast.....	3.50
Bowmantown, Pa.—Core.....	1.35@1.50
Molding, coarse.....	2.00@2.40

(Continued on next page)

Wholesale Prices of Sand and Gravel

Prices given are per ton, F. O. B., at producing plant or nearest shipping point

Washed Sand and Gravel

City or shipping point	Fine sand, 1/10 inch down	Sand, 1/4 inch and less	Gravel, 1/2 inch and less	Gravel, 1 inch and less	Gravel, 1 1/2 inch and less	Gravel, 2 inch and less
EASTERN:						
Ambridge, South Heights, Pa.....	.75	.75	.75	1.30	1.00	1.00
Attica, N. Y.....	.48	.48	1.70	1.35	1.40	1.40
Farmingdale, N. J.....	.90	1.25	1.15	1.15	1.15	1.15
Hartford, Conn.....	.50@.60	1.75@2.00	1.50	1.50	1.50*	1.50*
Leeds Junction, Me.....	.75*	1.70	2.00	1.40	1.20	1.20
Ludlow, Mass.....	.75	.75	2.00	1.40	1.20	1.20
Washington, D. C.....	1.20@1.30	(crushed gravel)				
York, Pa.....						
CENTRAL:						
Alton, Ill.....	.60@.75	.60@.75	1.50@4.50	1.30	1.20	1.20
Anson, Wis.....	.60@.70	.60@.70	1.25@1.50	1.25	1.00@1.15	1.00@1.15
Attica and Covington, Ind.....	1.00	1.00	1.25	1.25	1.25	1.25
Barton, Wis.....	.70	.70	.80	.80	.80	.80
Chicago, Ill.....	1.75@2.25	1.95@2.45	1.75@2.25	2.00	2.00	2.00
Cincinnati, O.....	2.05	2.00	2.00	2.00	2.00	2.00
Columbus, Ohio.....	.70	.70	.70@1.00	.70@.80	.70@.80	.70
Des Moines, Ia.....	1.00	.75	1.65	1.65	1.65	1.65
Earlestead (Flint), Mich.....	.60	.70	1.05	.95	.95	.95
Eau Claire, Wis.....	.60	.60	1.35	1.10	1.10	1.10
Elgin, Ill.....	.80	1.00	.80	.80	.80	.80
Elkhart Lake, Wis.....	.75	.60	1.00	.84	.84	.84
Grand Rapids, Mich.....	.60	.60	.90	.85	.85	.85
Greenville, Mechanicsburg, O.....	.80	.80	1.00	.85	.85	.85
Humboldt, Ia.....	1.00	.85	1.90	1.90	1.90	1.90
Indianapolis, Ind.....	.60	.60	1.50	.75	.75	.75
Janesville, Wis.....	.65	.65	1.85	1.85	1.75	1.75
Mason City, Ia.....	1.00	.90	2.00	1.30	1.30	1.30
Milwaukee, Wis.....	1.20	1.20	1.30	1.30	1.30	1.30
Minneapolis, Minn.....	.50	.50	2.00	1.75	1.50	1.50
Moline, Ill.....	.90	.90	1.30	1.30	1.30	1.30
Oxford, Mich.....	(60-40 mix, .95 per ton)					
Pittsburgh, Pa.....	(Sand, 1.30; gravel, 1.00)					
Saginaw, Mich., f. o. b. cars.....	1.30	1.30	2.20	1.95	1.50	1.50
St. Louis, Mo., f. o. b. cars.....	1.55	1.55	1.75	1.55	1.00	1.00
Summit Grove, Clinton, Ind.....	1.00	1.00	1.00	1.00	1.25	1.00
Terre Haute, Ind.....	1.00	1.00	1.00	1.00	1.25	1.00
Toledo, Ohio.....	.75	.75	2.00 per cu. yd.			
Winnipeg, f. o. b. cars.....						
Yorkville, Moronts, Oregon and Sheridan, Ill.....	.80@.85	.80@.90	.90@1.00	.80@.90	.80@.90	.80@.90
SOUTHERN:						
Flomaton, Ala.....	.85@1.00	.85	1.65	1.65	1.65	2.00@2.50
Knoxville, Tenn.....	1.25	1.25	1.65	1.65	1.65	1.50
Lake Weir, Fla.....	.75	.75	2.20	2.20		
Lincoln, Neb.....	.90	.90	2.20	2.20		
Macon, Ga.....	1.00	1.00	1.50	1.50	1.50	1.50
Memphis, Tenn.....	1.40	1.40	1.50	1.50	1.20	1.20
N. Martinsville, W. Va.....	1.40	1.40	3.00*			
New Orleans, La.....	.90	.90	3.00*			
Pelzer, S. C.....	1.25	.95	Concrete gravel, all sizes, 2.00			
Pine Bluff, Ark.....	.35	.35	1.25			
Roseland, La.....	.70	.70				
Tulsa, Okla.....	.70@.80	.70@.80				1.10
Waco, Texas.....						
WESTERN:						
Grand Rapids, Wyo.....	.50	.50	.85	.85	.80	.80
Kansas City, Mo.....	(Kaw River sand, car lots, .75 per ton, Missouri River, 1.50)	.90@1.10	.85@1.00	.85@1.00	.85@1.00	.85@1.00
Niles, Calif.....	1.00	.90	1.00@1.20	.85@1.00	.85@1.00	.85@1.00
Pueblo, Colo.....	1.00	1.00	1.00@1.20	.85@1.00	.85@1.00	.85@1.00
San Francisco, Calif.....	.60@.75	.60@.75	.60@.75	.60@.75	.60@.75	.60@.75
Saratoga, San Jose, Calif.....	1.30*	1.30*	1.30*	1.30*	1.30*	1.30*
Vancouver, B. C.....						

Bank Run Sand and Gravel

City or shipping point	Fine Sand, 1/10 inch down	Sand, 1/4 inch and less	Gravel, 1/2 inch and less	Gravel, 1 inch and less	Gravel, 1 1/2 inch and less	Gravel, 2 inch and less
EASTERN:						
Boonville, N. Y.....	.60@.85	.60@.85		.90	.90	.90
Fishers, N. Y.....	.85@1.00	.85@1.00		1.00	1.00	1.00
Hartford, Conn.....	1.00*	1.00*				
Yardville, N. J.....	.50@.75	.50@.75				
York, Pa.....	1.20@1.30	1.20@1.30				
CENTRAL:						
Attica, Covington, Silverwood, Ind., and Palestine, Ill.....	.85	.85	.85	.85	.85	.85
Des Moines, Ia.....	Washed con. mix., 25% gravel, 1.00; 50% gravel, 1.20					
Earlestead (near Flint, Mich.)	.60 per yd.					
Elkhart Lake, Wis.....	.75 per ton (washed concrete material)					
Ft. Jefferson, Mechanicsburg, O.....	.70	.60	.60	.75	.80	.60
Grand Rapids, Mich.....	.40	.40	.75	.80	.60	.60
Greenbush, Mich.....	.65	.65	.70	.70		
Hersey, Mich.....			.70	.70		
Janesville, Wis.....			.70	.70		
Lincoln, Neb.....			.75	.75		
Oxford, Mich.....			.75	.75		
Saginaw, Mich., f. o. b. cars.....	.75	.75	1.30	1.30	1.30	1.30
St. Louis, Mo., f. o. b. cars.....	.65	.65	.65	.65	.65	.65
Summit Grove, Ind.....	.65	.65	.65	.65	.75	.75
Toledo, Ohio.....			.65	.65	.75	.75
Yorkville, Oregon, Moronts and Sheridan, Ill.....	.75@.85	.75@.85			.70	.70
SOUTHERN:						
Albany, Ga.....	.70@1.00	.70@1.00				
Dudley, Ky. (Crushed Sand).....	1.15	1.15		1.10		
Lindsay, Tex.....				.50		
Valde Rouse, La.....					.60@.75	.60@.75
Waco, Texas.....					.95	.95
WESTERN:						
Saratoga, San Jose, Calif.....	.60@.75	.60@.75	.60@.75	.60@.75	.60@.75	.60@.75
Yorkville Ore.....	.40	.40	.40	.40	.40	.40
Seattle, Wash.....	1.25	1.25	2.00	1.25		1.25

*Cubic yard. B Bank. L Lake. || Ballast.

Crushed Slag

City or shipping point	Roofing	1/4 inch down	1/4 inch and less	1/2 inch and less	1 1/4 inch and less	2 1/4 inch and less	3 inch and larger
EASTERN:							
Bethlehem and Emaus, Pa.	2.50	.90	1.50	1.20	1.20	1.20	1.20
Buffalo, N. Y.	2.25	1.25	1.25	1.25	1.25	1.25	1.25
E. Canaan, Conn.	4.00	1.10	2.50	1.35	1.35	1.25	1.25
Eastern Pennsylvania and Northern New Jersey	2.50	.90	1.50	1.10@1.25	1.10@1.25	1.10@1.25	1.10@1.25
Eric, Pa.	2.25	1.25	1.25	1.25	1.25	1.25	1.25
Emporium, Pa.	2.25	1.25	1.25	1.25	1.25	1.25	1.25
Hokendaugua and Donaghmore, Pa.	2.50	.90	1.50	1.20	1.20	1.20	1.20
Lebanon, Pa.	2.50	.85	1.50	.85	.85	.85	.85
Sharpsville and Struthers, Pa.	2.00	1.20	1.60	1.20	1.20	1.20	1.20
Western Pennsylvania	2.50	1.25	1.25	1.25	1.25	1.25	1.25
CENTRAL:							
Chicago, Ill.							
Detroit, Mich.	2.05	1.00	1.10	1.25	1.25	1.00	.95
Ensley, Ala.	2.00	1.25	1.60	1.25	1.25	1.25	1.25
Ironton, Jackson, O.							
Toledo, O.							
Youngstown, Dover, Hubbard and Leontonia, O.	2.00	1.20	1.60	1.20	1.20	1.20	1.20
SOUTHERN:							
Ensley, Ala.	2.05	1.00	1.25	1.25	1.25	1.00	.95
Longdale, Goshen, Glen Wilton and Low Moor, Va.	2.50	1.00		1.25	1.25	1.15	1.05

Agricultural Lime and Hydrate

	—Agricultural Lime—		Per Cent CaO	Per Cent MgO	Agricultural Hydrate
	Bulk	Bags			Bags
EASTERN:					
Adams, Mass.			98	38	8.00
Belleville, Pa.	9.00		95.5		11.50
Berkeley, R. I.			50	18	15.00
Cavetown, Md.	8.50				
Cedar Hollow, Devault, Rambo and Swedeland, Pa.	8.00	10.75 grd.	58	38	10.75
Chippewa, Pa.	6.50@7.00		78.67	1.33	
Farnams, Mass.	6.50	8.00	60	2	
Frederick, Md.	7.75		88	5 to 8	10.50
Grove, Md.	6.00		85	2	8.00
Highgate Springs, Va.	5.50@7.50		94.68		
Holidaysburg, Pa.	5.00	8.50	80.23	2.87	
Hyndman, Pa.	8.00	10.75			10.75
Lime Kiln, Md.	5.25@6.50		80.56-62.56	3.87-1.75	
Lime Ridge, Pa.	6.75		95.65		
Mt. Union, Pa.			57	38	8.00
Newburgh, N. Y.	3.50	4.50	47.6 to 50.4	0.62 to 1.12	
New Castle, Pa.	4.00@6.00		60	12	
Paxtang and Lemoyne, Pa.	8.00		90	5	
Rosendale, N. Y.	11.00	5.50	73	1	13.00
Union Bridge, Md.	6.25	11.00	84-87	2-3	11.00
Williamsport, Pa.	5.50	8.00	68		
West Rutland, Vt.	3.35	5.35			12.00
West Stockbridge, Mass.	10.50		96.31	2.73	13.00
York, Pa.					
CENTRAL:					
Alton, Ill.	12.00		97.0		13.50
Delaware, O.			50.0	12	
Knowles and Valders, Wis.	4.00	9.00	55	45	13.00
Manistique, Mich.	11.00		95	2	11.00
Marblehead, O.					13.00
Mitchell, Ind.	5.50	8.50	58	40.5	13.50
Sheboygan, Wis.	10.50		54	45	
Woodville, Ohio					13.00
SOUTHERN:					
Blowers, Fla.	5.50	8.00	98.0		
Burns, Tenn.	10.00		96	0.54	14.00
Chippewa, Fla.	5.00		80.80	15.0	
Claremont, Va.	5.00	7.00	85-95	2-5	
Dittlinger, Texas	9.00@11.00		98.62	0.29 12.50@15.00	
Erin, Tenn.	11.00		97.82	0.12	
Knoxville, Tenn.	3.00		60	15	14.00
Lushing, Va.	6.50	11.25	84		6.50
Maxwell, Ala.	8.10		99.33		
Ocala, Fla.	4.00	6.00 pulv.	98 1/2 (dry basis)		
Staunton, Va.	9.00	11.50	80.00	15.00	
WESTERN:					
Colton, Calif.	15.00		97	2	
Kirkland, N. Mex.	12.50		96	0.33	15.00
San Francisco, Calif.			96	2	
Tehachapi, Cal.	6.00	8.00			

Miscellaneous Sands

(Continued from preceding page)

Bridgeton, N. J.—Core	2.00
Cleveland, O.—Molding coarse	2.00@2.50
Brass molding	2.00@2.50
Molding fine	2.00@2.50
Core	1.25@1.50
Columbus, O.—Core	1.25@2.00
Brass molding	3.00
Furnace lining	2.50@3.00
Molding fine, steel molding	2.50@3.00
Conneaut, O.—Molding fine	2.25@2.50
Molding coarse	2.00@2.25
Delaware, N. J.—Molding fine	2.00
Brass molding	1.90
Brass Molding	2.15
Eau Claire, Wis.—Core	.60@.70
Sand blast, wet	1.75@2.25
Sand blast, dry	3.00@3.50
Traction	.60@.70
Fleetwood, Pa.—Furnace lining	2.25
Franklin, Pa.—Traction	2.25
Brass molding	2.50
Core	3.00
Molding fine	3.00
Molding coarse	3.00
Sand blast	5.00
Greenville, Ill.—Molding coarse red.	2.00@2.25
Guion, Ark.—Molding	2.50@3.00
Roofing	2.50
Stone sawing	2.50
Hancock, Md.—Core and brass midg.	1.65
Hellam, Pa.—Core	2.00@2.50
Joplin, Mo.—Stone sawing, flint	1.25
Kansas City, Mo.—Missouri River core	.80
Klondike and Gray Summit, Mo.—Molding fine	2.00@3.00
Lake Weir, Fla.—Sand blast	.60
Mapleton, Pa.—Core, furnace lining, molding fine and coarse damp.	2.50
Core, furnace lining, moulding, fine and coarse, dry	3.00

Massillon, O.—Molding fine	3.00
Core	3.00
Molding coarse	3.00
Traction	3.00
Furnace lining	3.50
Michigan City, Ind.—Core, bank	.75@1.00
Millington, Ill.—Core and furnace	2.25@3.00
Core, washed	2.25@3.00
Mineral Ridge, O.—Core, molding, sand blast, roofing, etc., washed, screened (damp)	3.00
Montoursville, Pa.—Core and traction	1.50@2.00
Brass molding, fine, core	1.75@2.25
Ohio—Various points:	
Iron molding, fine	1.50@2.25
Iron molding, coarse	1.75
Brass molding, minimum	2.00
Oregon, Ill.—Core, furnace lining, molding fine, brass molding	2.50
Sand blast, molding coarse	3.50
Ottawa, Ill.—Crude silica sand	1.25
Ottawa, Ill.—Core, furnace lining, roofing	3.00
Sand blast	5.00
Glass sand	2.50@3.00
Molding steel	3.00
Providence, R. I.—Molding fine	2.00
Molding coarse	1.90
Brass molding	2.25
Sand blast	3.00@4.00
Ridgeway, Pa.—Glass sand, green	2.25
Glass sand, wash	2.50
Molding, fine and coarse	1.20
Rockwood, Mich.—Molding, roofing, stone sawing	3.00@4.00
Sand blast	3.50@4.00
Thayer, Pa.—Traction	2.25
Furnace lining	1.25
Molding	1.50
Core, steel	2.25
Tygart, Ky.—Core and stone sawing	2.60
Fire-brick sand, washed but not dried	2.15@2.40
Utica, Pa.—Core	2.00
Molding fine	2.50
Molding coarse, traction	2.50
Brass molding	2.50
Sand blast	3.50
Warwick, Ohio—Core, furnace lining, molding fine and coarse (dry)	3.00
Same, green	2.50
Wedron, Ill.—Core (crude silica)	1.00
Molding fine, coarse	1.00
West Albany, N. Y.—Molding fine	1.75@2.25
Molding coarse	1.50
Brass molding	1.75
Zanesville, Ohio—Molding	2.50@3.00

Crushed Gypsum

Castalia, O.—Crushed, to cement mills	3.50
Ft. Dodge, Ia.—Bulk	3.50
Grand Rapids, Mich.—Crushed gypsum rock	4.50
Gypsumville, Man., Can.—Crushed	3.50
Oakfield, N. Y.	4.00
Gypsum, O., and Akron, N. Y.	4.50@5.50

(Gypsum) Land Plaster

Castalia, O.—Land plaster	6.00
Bags extra—Jute, 3.00; ppr., 1.00.	
Garhutt, N. Y.—Land plaster, bags	7.50
Grand Rapids, Mich.—Ground gypsum rock	8.50
Oakfield, N. Y.—Ground Gypsum rock	8.00
Sandusky, O.	6.00
Jute, 3.00 extra; ppr., 1.00 extra.	

Ground Rock Phosphate

Centerville, Tenn.—B. P. L., 70%; ton, 2000 lbs. (90% thru 100 mesh)	9.00@10.00
Lump rock, 72% to 75%, B. P. L.	6.00@8.50
Centerville, Tenn.—B. P. L., 65%	8.25
B. P. L., 70%	9.00@10.00
Brown rock, 75% and better	12.00
Gordonsburg, Tenn.—2000 lbs. (90% thru 100 mesh)—B. P. L., 60%	6.00
B. P. L., 65%	7.00
B. P. L., 70%	9.50
B. P. L., 75%	12.00
Lump rock, long ton, 70%	9.00
Mt. Pleasant, Tenn.—(B. P. L. 68%) 13% phosphorus	7.00
14% phosphorus	8.00
Mt. Pleasant, Tenn.—B. P. L., 70%	9.00@15.00
Norwalk, Fla.—Fla. Hard Rock (B. P. L. 68%)	10.00
Wales, Tenn.—(B. P. L., 70%)	8.75

Florida Soft Phosphate

Croon, Fla.—Ground pebble, 30%	16.00
Pulverized soft, 26%	17.50
Jacksonville (Fla.) District	10.00@12.00
(Add 2.50 for sacks)	
Phoslime, Fla. (in burlap bags)	15.00

General News from Rock Product Markets

Indiana Gravel Men in Controversy Over Intrastate Freight Increases

THE INDUSTRY IN INDIANA is waiting with considerable interest the final ruling of the Indiana public service commission on the petition of the railroad companies in the state for an increase of forty per cent in freight rates. Just recently the commission refused to permit the roads to charge an increase of twenty per cent in passenger rates, but thus far no definite ruling has been made on the freight side of the case. A hearing the latter part of August gave the sand and gravel industry an opportunity to present information to the commission to show the inequality of rates between Indiana and Illinois. The position of the industry was not one particularly against the railroad companies and the proposed increase, for throughout all the hearing the industry let it be known that it wanted the railroads properly financed, but the witnesses did protest spiritedly against a difference in rate between Indiana and Illinois.

At one period of the hearing, E. Guy Sutton, business manager of the Indiana Sand and Gravel Producers' Association and also of the National Association, was asked if the sand and gravel producers would be willing to enter into an agreement by which the protest on the part of the industry would be withdrawn with the provision that the railroad companies give prompt attention to rate adjustments immediately after the taking effect of the increase. The carriers wanted the rates in effect before Sept. 1.

Mr. Sutton offered to have a committee of sand and gravel producers meet with the railway men immediately and continue day and night if necessary to effect the proper adjustments. E. I. Lewis, chairman of the state commission, asked the railway representatives if they would consent to such an arrangement and after a whispered conference they refused on the ground of impracticability.

Mr. Sutton again was asked if the sand and gravel men wanted to withdraw in favor of the railways, to which he replied that the association had a moral obligation in the matter since its representatives were speaking for a large number of contractors in the state who could not pass the burden of the increase in rates to the consumer and who were not present to give their approval to the withdrawal; also that the evidence setting forth the rights of the trade had been presented in good faith and without prejudice to the needs or rights of

the railways and that the association preferred to stand on that ground.

Later, in conversation with Mr. Sutton, the railway representatives indicated that they appreciated the attitude taken by the sand and gravel producers and expressed their willingness and desire to take up the matter at an early date in order to bring out a quick and equitable adjustment in the event the commission decided against the sand and gravel producers.

Mr. Coapstick, an attorney for the State Chamber of Commerce, looked after the interests of the crushed stone, brick and coal men and at all times during the hearing which lasted almost a week, was willing to co-operate with the sand and gravel interests.

Priority Order Suspended

OWING TO CONGESTION of coal at Atlantic ports, the Interstate Commerce Commission suspended for five days, beginning Sept. 2, its recent order giving priority to coal shipments by water to New England States.

According to the order, coal held under priority in railroad cars at Atlantic ports has resulted in undue delay to rail equipment, as ships are not available for loading. By suspending the priority order the commission hopes to end the congestion and release many coal cars.

How Long Will Priority Order for Coal Continue?

REGARDING THE ISSUANCE of Service Order No. 12, Sec'y A. P. Sandles, of the National Crushed Stone Association, has sent the following letter to the Interstate Commerce Commission, Washington, D. C.

"The crushed stone industry as well as other mineral aggregate producers, with their big investment and army of wage earners, are very anxious to know whether Service Order Nos. 7, 9 and 12 will be amended and continued at the expiration of the 90-day period, September 21, 1920.

"We have suffered loss. We have existed in a zone of doubt and uncertainty. We had hope that 30 days would be the period of our distress. It was extended to sixty, then to ninety days.

"We do not know that it is proper to even ask, or for your commission to answer the question,

"Is there likelihood that car service will be denied to our industry after September 21, 1920?"

"If so, some of our quarry plants would be glad to know, as such information would enable them to retrench and save themselves from further loss.

"We have tried to be patient and accept the judgment of your Commission as to the best thing for the country at large. We have not sought, tormented, criticised or worried your body in this matter. If you can give us any information or intimation as to what we may hope for or expect in the future we will thoroughly appreciate same."

Fights Car Quota Bribes

BRIBERY BY SHIPPERS of railroad employees to obtain more than a pro rata share of freight cars has resulted in an aggressive campaign by the Pennsylvania railroad to break up the practice, according to a statement issued yesterday by the Pennsylvania. The suggestion has in some instances originated with the shipper, and in many other cases the employees themselves have solicited bribes, it is said.

"In one of the most recent cases," says the statement, "the superintendent of a coal company's store in Western Pennsylvania was found to have corrupted the railroad company's car distributor in his district and to have entered into collusion with him to purchase the output of a 'wagon mine,' at low prices, in consideration of furnishing a full car supply. Upon unquestionable proof of the facts, the car distributor was at once discharged. Similar action has been taken in a number of other cases and redoubled precautions will be taken in the future to wipe out entirely a practice which is grossly unfair to the general shipping public, demoralizing to the employees, and directly in violation of the spirit of the laws of forbidding discrimination in the utilization of railroad facilities.

"The operating and traffic officers throughout the Pennsylvania system have been thoroughly informed regarding the situation and have been instructed to ask the co-operation of shipping in all parts of the Pennsylvania system territory for the purpose of arousing public sentiment against attempts of any kind to corrupt railroad employees in the performance of their duty."

New Market for Silica Sand

General glass products in the nature of bottles will be manufactured in Birmingham, Ala., in a \$400,000 plant to be built by the Birmingham Glass Manufacturing Co., a new enterprise organized by New York and Alabama capitalists, who have secured a site and land containing several million tons of silica sand. The officers named for the first year are Sol W. Quinn, president; H. C. Bryson, vice-president, both of New York, and E. R. Owen, secretary, of Birmingham, Ala.

General News from Rock Product Markets

Registration at Rock Fertilizers' Meeting

THE REGISTRATION of those present at the rock fertilizers' meeting, described on page 45, was as follows:

C. E. Brainard, Chicago, Ill.—Brainard Pulverizer Co.
 Norman G. Hough and Warren Henley, Chicago, Ill.—American Cement Plaster Co.
 P. Miller, Chicago, Ill.—Prairie State Fertilizer Co.
 J. J. Sullivan, Chicago, Ill.—Dolese and Shepard Co.
 Chas. A. Weller, Knoxville, Tenn.—Mining Engineer.
 V. H. Searight, Chicago, Ill.—Engineer, Fuller-Lehigh Co.
 F. T. Greaves, Chicago, Ill.—Engineer, Malcolmson Briquet Engineering Co.
 Joseph M. Sheahan, Chicago, Ill.—The Chicago Association of Commerce.
 A. J. Parker, Chicago, Ill.—Poultry Feed Co.
 Davis Gray, Columbia, Tenn.—Tennessee Agricultural Chemical Corp.
 Claude L. Clark, Columbus, O.—National Agricultural Limestone Ass'n.
 Virgil H. Lanier, Jacksonville, Fla.—The Soft Phosphate Ass'n.
 George Thomson, Chicago, Ill.—Thomson Phosphate Co.
 H. H. MacDonald, Chicago, Ill.—Gypsum Industries Ass'n.
 Dr. Wm. Crocker, Chicago, Ill.—University of Chicago.
 Virgil G. Marani, Chicago, Ill.—Gypsum Industries Ass'n.
 S. B. Kanowitz, Chicago, Ill.—Raymond Bros. Impact Pulverizer Co.
 Bert Ball, Chicago, Ill.—National Crop Improvement Service.
 R. Van Deusen, Chicago, Ill.—U. S. Gypsum Co.
 Chas. F. Henning, Chicago, Ill.—U. S. Gypsum Co.
 E. T. Angell, Chicago, Ill.—Sears Roebuck & Co.
 J. H. Prost, Chicago, Ill.—International Harvester Co.
 A. E. Pye, Chicago, Ill.—Rogers & Co.
 Robert B. Campbell, J. E. Ford, M. V. Angel, D. J. Hamilton, J. F. Jenkins, E. H. Favor, Chicago, Ill.—"American Fruit Grower."
 Duane W. Gaylord, Chicago, Ill.—"American Farming."
 Frank B. White, C. P. Hooker, Chicago, Ill.—Agricultural Publishers Ass'n.
 Frank McClure, Chicago, Ill.—Fort Dearborn National Bank.
 Paul Stephens, Chicago, Ill.—"American Farming."
 C. A. Tupper, C. E. Schaeffer, J. E. Montgomery, W. R. Harris, A. G. Griffin, Chicago, Ill.—International Trade Press Corp.
 Geo. P. Miller, Chas. A. Breskin, Chicago, Ill.—"Rock Products."

Slump in Potash Trade

THE AMERICAN COMMISSION at Berlin reports that there is a general slump in the potash trade in Germany. Sales are now and for some weeks have been slowing down almost to a standstill. The domestic market is showing no interest whatever in purchase of supplies for the fall trade.

Farmers will not buy because of high prices. If there should be a reduction of price it is expected the farmers late in the season will buy moderately for fall seeding. But this will not be in a volume sufficient to affect the export trade either in quantity available or prices. There are no exports of potash whatever from Germany at this time to the United States.

Lime for Soil Improvement

"LIME AND THE VEGETABLE GARDEN" and "Methods of Applying Lime," are the titles of two practical

pamphlets just published by the National Lime Association. The former pamphlet was prepared by Prof. Elmer O. Fippen, manager of the agricultural department, and secretary of the National Lime Association, while the latter was prepared by John A. Slipher.

American Phosphate Beds

THE UNITED STATES GOVERNMENT has 2,500,000 acres of land for lease in tracts not exceeding 2,560 acres each in Wyoming, Idaho, Utah and Montana. The lands in question contain valuable deposits of phosphate rock, which are exceedingly important as fertilizer. Japan, for example, has attached so much value to the phosphate deposits that her commercial houses are preparing to move hundreds of thousands of tons annually from Idaho through the port of Portland to the flowery kingdom. If phosphates are good for Japan why not for America?

Beaver Board Co. Increases Capital \$50,000,000

AN INCREASE IN CAPITAL of \$50,000,000 is being effected by the Beaver Board Companies, of Buffalo, N. Y., from \$80,000,000 to \$130,000,000. This is to allow for extensions at the plant of the Bestwall Mfg. Co., Akron, N. Y., recently acquired as a subsidiary interest. Raw material for manufacture will be secured from the gypsum properties of the American Cement Plaster Co., also recently taken over by the Beaver Board Co.

Large Blast at Concrete, Wash.

THE LARGEST BLAST ever fired in this region was set off at the Superior quarry of the Superior Portland Cement Co., just above Concrete, on Aug. 9. The explosion was barely heard in town, and a slight tremor was the only apparent effect. Over 17,000 pounds of high grade explosive were used, and from 125,000 to 140,000 tons of rock were loosened by the explosion, sufficient to provide the needs of the cement plant for the balance of the year. The blast caused slight damage to the railway trestle, when it wrecked several bents leading to the quarry, caused by part of the huge mass of rock sliding down against the frame work of the trestle. Preparations for this blast have been under way for some time. The greater part of the explosive was placed in "coyote holes," bored into the face of the quarry for distances of from forty to fifty-three feet. A number

of "well holes" were also drilled, in order to leave a square face on the quarry after the explosion. The plans for the blast all proved successful, and although it entailed a great expenditure, the company figures that the operation will save money in the end, over the old system of blasting down small quantities of rock at a time.

National Association Sand and Gravel Producers Start Membership Campaign

PURSUANT to the expressed sentiment of members of the National Association of Sand and Gravel Producers at the last annual convention, a campaign for increased membership is being planned.

Meetings are to be held in Kentucky, Tennessee, Georgia, Alabama, Mississippi and Louisiana, in the order named. It is hoped to have every producer who should be, at these meetings, and any producers who are not present will be followed up and a strong effort made to bring them into the fold.

Co-operation is urged from all members, for the results obtained will depend largely upon the efforts of members in the localities in which the meetings will be held. All of the meetings will be attended by V. O. Johnston, president, and E. Guy Sutton, business manager of the association, who will preach the doctrine of "United We Stand, Divided We Fall."

Pennsylvania Gravel Men Protest Railroad Rates

THE PENNSYLVANIA SAND & GRAVEL PRODUCERS' ASSOCIATION, with headquarters at Pittsburgh, has filed a complaint with the Public Service Commission of the state against twenty railroad companies operating in western Pennsylvania. The organization asks for a review of existing schedules, holding that such are not on a uniform basis and are preferential.

Lime Storages Popular

INABILITY TO OBTAIN limestone when needed has been the reason given by many farmers for not using lime to correct acidity in their soils and thus enable them to grow greater crops. Through co-operative efforts of the county farm bureaus, associations are being formed for the erection of limestone storage bins. By this means farmers, particularly those living in the hilly sections, are able to haul lime when roads are good and at such times as they have opportunity.

General News from Rock Product Markets

Pennsylvania Limestone and Steel Men Will Fight Freight Increase

TRAFFIC REPRESENTATIVES of lime producing and steel concerns and of the Youngstown, Ohio, Chamber of Commerce will confer with railroad rate authorities in Pittsburgh on limestone rates established by the railroads from Pennsylvania quarries to Youngstown, O.

Producers and consumers of fluxstone will ask for a reduction in the rate to Mahoning valley furnaces on the ground that the new figure is unfair.

The recent 40 per cent raise granted the railroads by the interstate commerce commission increased the rate on limestone from Pennsylvania quarries supplying Youngstown plants from 60 to 84 cents a ton. The rate applies to a considerable district, plants here being subject to the same tonnage charge as those as far away as Woodlawn, Pa.

While the old 60-cent rate applied to the same territory the fact that the charge was comparatively low deterred the steel companies here from asking differentials, but the advent of the new rate has brought the steel men face to face with what they consider a heavy overcharge for moving low class freight only a few miles.

The steel companies, through their traffic heads, will ask that rates be cut in favor of Youngstown and will declare that it is unfair for the railroads to charge as high a rate from Hillsville to Youngstown, 5½ miles, as from Hillsville to Woodlawn, about 30 miles.

Should the rate committees of the railroads refuse to reduce the charge limestone producers and steel men will file an application for a hearing before the interstate commerce commission and will produce evidence which they regard as conclusively showing the rate to be inequitable.

At an early date the steel companies are likely to go before the commission with applications for the reduction of rates on finished steel. The basis of this contention will be that many of the rates with the addition granted by the commission bear unfairly on business in the Mahoning valley.

No Change in Cement

THE CHANGE in the building material price situation is not being felt in the cement department. Although the inquiries during August for cement have been greater than ever known, exceeding the totals for March, April, May, June and July combined, and at the first of

the month the cost of electric power in the Lehigh manufacturing district advanced 21 per cent., there does not seem to be much indication that prices will be advanced above the present level, at least just now, according to Dow Service Daily Building Reports. On the other hand there is little likelihood of prices of this commodity dropping to any extent. The keenest and most analytical minds simply say that over the period of the next few months the price of domestic cement will be found approximately where it is today. They gave as their reason for the expected stability that the market is fairly wriggling with export agents trying to obtain American cement for foreign markets. In August the total cement exports amounted to 700,000 barrels more than was shipped out of this country in August of last year, the record for last month being 1,645,000 barrels as against 930,000 barrels a year ago.

Development of Liquid Oxygen Blasting Explosives During the War

THE BUREAU OF MINES, Department of the Interior, has recently issued Technical Paper No. 243, "Development of Liquid Oxygen Explosives During the War," by Geo. S. Rice, chief mining engineer. The paper describes the results of experiments conducted by the bureau at its explosives testing station near Pittsburgh, Pa., and gives an account of the methods of use as developed in Germany, observation on its use by the Germans for destroying French iron and steel plants, and an abstract of a German military paper on instructions for using liquid air explosive.

During the war the growing scarcity of glycerin and ammonia greatly increased the cost of dynamite. This caused the Bureau of Mines to investigate the possibilities of liquid oxygen explosives, which do not require nitrates. Results of the preliminary testing begun in April, 1917, were decidedly favorable. Mr. Rice, while in Europe in 1919, as a member of a committee to observe progress in post-war industries, paid special attention to liquid-oxygen explosive. The Germans were found to have used the explosive, known as "oxyliquit," extensively in nongaseous coal mines, in excavating subways and tunnels, in quarrying, and in iron mines, as well as for destroying French steel plants.

The explosive was first tested at a coal mine in Germany following Linde's invention of his liquefying apparatus in 1895. Trials made in driving the Simplon Tunnel are said to have been favorable.

In 1900, Claude, of France, patented the

rectification principle. Linde, in 1902, designed his rectification apparatus. Both types of apparatus are extensively employed in liquefying gases. In 1904, Dewar, of Great Britain, invented the Dewar flask for liquefied gases.

Further development of liquid oxygen for blasting purposes was small until the war began. As stated, its use was widely extended in Germany during the war.

The allied countries, being able to import nitrates from Chile, did not take up its use, but if the war had continued the United States would probably have been compelled to do so. The method will now have to depend on its merits and on commercial conditions.

The experiments of the Bureau of Mines have shown that a liquid oxygen explosive can be prepared which has a blasting strength greater than "40 per cent" straight nitroglycerin dynamite. This was shown by tests in the standard testing apparatus of the Bureau, as well as in blasting.

The procedure adopted was to place a No. 6 detonator in the inner cartridge, a cheese-cloth sack containing carbonaceous material. The cartridge is soaked in liquid oxygen 10 to 15 minutes in an improved container devised by the bureau. The cartridge, frozen stiff, is slipped into a pasteboard container, placed in the hole, a wad of cotton placed on it, a brass tube inserted, and clay tamped around the tube. The hole left by the tube provides an outlet for evaporating oxygen, until the shot is fired.

The advantages, as compared with dynamite and black blasting powder, are lower cost per ton of material blasted, elimination of dangers in transportation, from premature ignition, misfires, or unexploded sticks in ore or coal, in handling and thawing, or in storage magazines.

The disadvantages are: the liquid oxygen, because of its rapid evaporation must be used quickly after charging, thus limiting the number of shots. A liquefying plant must be maintained near the mine. The explosive can not be used in gaseous coal mines.

Its introduction into mines is difficult, because miners are not accustomed to it. The method offers great possibilities for lessening blasting costs in nongaseous coal mines, and in metal and mineral mines using a chamber method where only a few shots are fired at one time. The chief cost is that of the oxygen, but there is hope of a decided reduction in cost through promised improvement in liquefying machines.

Copies of this paper may be obtained free of charge by addressing the Director of the Bureau of Mines, Washington, D. C.



Passed By The Screens



Incorporations

The Gerrard Barclay Co., Barre, Vt., has increased its capitalization from \$25,000 to \$50,000.

The Blue Ridge Talc Co., Henry, Va., has increased its capitalization from \$100,000 to \$150,000.

The Ohio and Michigan Sand Co., Toledo, Ohio, has increased its capitalization from \$25,000 to \$150,000.

The Allatoona Sand Co., Cartersville, Ga., has been incorporated for \$10,000 by C. H. Rutherford and H. S. Benson.

The Smallwood-Low Stone Co., Steubenville, O., has been incorporated for \$50,000 by F. E. Low, W. T. Smallwood, G. W. Tice, H. M. Low and M. G. Smallwood.

The Racine Crushed Stone Co., Racine, Wis., has been incorporated for \$200,000 to quarry and deal in limestone sand, gravel, etc., by E. B. Deutsche, A. L. Mogenson and Wm. B. Deutsche.

The Chapman Sand and Gravel Co., Brooklyn, N. Y., has been incorporated for \$25,000 by S. M. Chapman, A. A. Edelman and T. H. J. Sluyter, all of 1105 Metropolitan Ave., Brooklyn.

The Central Shale Oil Corp., Dover, N. J., has been incorporated for \$1,000,000 to manufacture blend and obtain by mining, drilling, pumping and treating in any manner shale, coal, rock and minerals of all kinds.

The Idaho Granite Co., Twin Falls, Ida., has been incorporated for \$10,000 to manufacture monuments and tomb stones by E. W. Davis and William Warberg, of Twin Falls, and E. E. Amsden, of La Grande, Ore.

The New Brookland Sand Concrete Co., New Brookland, S. C., has been incorporated for \$50,000 by D. E. George, pres., and J. S. Burdick, sec'y-treas., both of New Brookland, and C. G. Sonntag, vice-pres., of Gaston, S. C.

The Emeralite Surfacing Products Co., Minneapolis, Minn., has been incorporated for \$50,000 to quarry and deal in crushed stone, etc., by C. E. Sager and W. Ed. Nelson of Minneapolis, and H. J. Langan and Silas M. Ford of St. Paul.

The Cache Creek Gravel Co., a California company, has been incorporated for \$10,000 by F. M. Hathaway, 445 Orchard St., Oakland, Calif.; Geo. C. Baker, Yolo, Calif., and Geo. N. Nash, 2758 Piedmont Ave., Berkeley, Calif.

The Long Monument Co., Sioux Falls, S. D., has been incorporated for \$50,000 to buy, sell and manufacture stone, granite and marble for monuments, decorations, buildings, etc., by J. H. Long, A. Long and F. S. Shadle, all of Sioux Falls.

The Augusta Silica Mining Co., Augusta, Ga., has been incorporated for \$50,000 to develop a sand and gravel tract. The officers are G. W. Summers, pres.; W. H. Rook, vice-pres.; F. P. Farrar, sec'y-treas. The daily output of the new plant will be 15 cars.

Quarries

The Hughes Granite and Quarry Co., Clyde, Ohio, chartered in June with capital stock of \$355,000, has registered with the Secretary of States to do business in Vermont with principal office in Montpelier. The company is developing quarries in Calais and surveys for a railroad have already been made. The incorporators are W. E. Hughes, president; O. S. Brumback, F. W. Hall, John Morch, secretary, and Ed. Swanson.

Chico, Texas.—According to Arthur S. Goetz, who is largely interested in the Lone Star Stone Company, which has just completed a rock crushing plant here, a car load of dynamite is to be used in blowing a large hill of stone to pieces as a means of providing material for the company's new crushing plant. It will be some time before the big charge of explosive is placed and touched off, he said. In the meanwhile the plant is turning out crushed stone at the rate of 1,500 tons a day. Mr. Goetz is also interested in the Thurber Products Company which is operating a rock crushing plant of similar capacity at Tiffin, Texas, ninety miles west of here. The extensive highway construction program which is now in progress in Texas is causing an enormous demand for crushed rock and all of the plants in the State are busy at this time, so far as advices received here are concerned.

The C. S. Norton Blue Stone Company, of Bedford, Ind., has filed a preliminary certificate of dissolution.

The Alexander King Stone Co., a Kansas corporation, has qualified to do business in Indiana. Thirty thousand dollars of its capital stock is represented here, and William Frankzman, of Ellettsville, Ind., is named as the agent.

Quarry workers of the Bloomington and Bedford districts, Indiana, returned to work Aug. 23 after being on a strike since July 20. About 600 men were affected, the strikers have asked for more wages and recognition of the union. They are returning to work at the old scale and did not succeed in their efforts for a closed shop.

The Tennessee Rock Products Co., Hagerstown, Md., has been incorporated for \$300,000 to quarry and mine minerals and do a general business along this line, by R. J. and E. N. Funkhouser of Hagerstown, and James B. Preston of New York City. The company was formed primarily to engage in the mining and preparation of roofing stone and has leased a large tract of land in Tennessee upon which there is an unusually fine lot of roofing stone material. A big plant is in the course of construction.

The Blue Diamond Plaster Co., Los Angeles, Calif., has announced the purchase of the rock quarry and crushing plant in Temescal Canyon from the Alle estate of Santa Barbara. The price paid for the property, plant and equipment by the new owners is reported to have been in excess of \$1,000,000. Although the plant, which is electrically operated, has a daily capacity of 1,500 tons, the output is not equal to the demand for the Temescal rock, it is stated by officials of the Blue Diamond Plaster Co., and new machinery and equipment are to be installed to increase production. According to W. N. Hay, vice-president of the company, this rock is used extensively by contractors and builders because of its toughness and light weight. The abrasive tests, it is stated, have shown that this rock loses only 10 per cent in the crushing process, while rock crushed from ordinary granite boulders loses as high as 33 1/3 per cent.

Lime

The American Agricultural Lime Co., Atlanta, Ga., has been incorporated for \$250,000 by Herbert O. Reeve, Frank C. Wilson, both of Atlantic, and Wm. R. Hale, New York.

The King Sand and Lime Co., Knoxville, Tenn., has purchased a half interest in 100 acres of land in the second district in Knox county for \$10,000, and will immediately begin improvements which will more than double the capacity of the lime producing plant already established on the land. The lime company of which E. W. King is president has been running two lime kilns for some time and has two more under construction which will soon be in operation. He is planning to construct three or four more kilns to meet the demands of his growing business and will also build a number of houses on the property for the use of his employees.

The Pacific Lime Co., Vancouver, B. C., Can., has a battery of five round kilns in constant operation at its Texada Island, B. C., plant, and is shipping its product to the Hawaiian Islands, Chile, Peru, Nicaragua, etc., to sugar plantations, as well as caring for local building business and the British Columbia pulp and paper mills. The company is now installing a hydrating plant and will have that product on the market in a few weeks. The company owns its own steamers for transportation and also operates sawmill and cooperage factory. R. F. Mather of Vancouver is general manager of the company, the other officers being as follows: President, E. D. Kingsley, 18 East 42d street, New York City; Sec'y-Treas., P. J. Maw; purchasing agent, A. L. Palmer, both of Vancouver, B. C.; sales agent, W. S. Keith, 405 Lowman building, Seattle.

Gypsum Products

The United States Gypsum Co. is reported to be going ahead at once with the development of its new gypsum property near Sweetwater, Tex. It is said \$1,000,000 will be expended on the largest and finest gypsum mill in the world.

The International Gypsum Corp., Ltd., Annapolis, Royal, N. S., Can., has been incorporated for \$1,500,000.

Fort Dodge, Ia.—The strike of the gypsum rock miners ended July 26, after the men had been out 21 days. The settlement effected was on the basis offered by the operators, that is, an advance of 60 cents per day instead of the dollar advance demanded by the strikers.

The Valmont Plaster Co., Valmont, N. M., has been incorporated for \$25,000, and will soon be in a position to make all kinds of plaster, brick, concrete blocks, and will deal in several kinds of building material. It is the expectation to have the plant running in a short time on a commercial basis and to be turning out cement to ship to various points.

Sand and Gravel

The Southern Silica Mining & Mfg. Co., Columbia, S. C., has purchased an additional sand pit and new loading machinery which will increase its daily capacity to 40 carloads.

The Doody Sand & Gravel Co., Mobile, Ala., has been incorporated for \$24,000 to engage in the business of selling sand, gravel and building materials, by W. J. Norville, J. W. Doody and J. C. Baker.

The Consolidated Stone and Land Co., Clove Road, Little Falls, N. J., suffered the loss of a portion of its sand and stone works, which were destroyed by fire on August 10, with loss estimated at about \$30,000, including equipment.

The Boston Sand and Gravel Co., Baltimore, Md., has issued financial statements of the company, showing earnings and expenses for July last and for the 12 months period ended July 31. Total earnings for the 12 months were \$692,100.21; total expenses, \$462,555.84, and interest on bonds, \$38,250, leaving a balance, before depreciation, of \$191,302.37. Earnings for July last were \$93,483.51 and expenses, \$48,553.08, leaving \$44,930.43 applicable to pay interest on bonds. This was about 14 times the amount needed, the interest amounting to \$3,105. Balance before depreciation was \$41,825.43. The company was outstanding \$602,000 in bonds, \$400,000 in 7 per cent. cumulative preferred stock, par value \$100, and \$800,000 in common stock, par value \$100.

Manufacturers

The Specialty Engineering Co., Philadelphia, Pa., has issued bulletin 1-C, giving a general description of Specialty Belt Conveyors. The bulletin is illustrated with photographs and drawings, and will be sent free, upon request.

The Ball Engine Co., Erie, Pa., is distributing bulletin S-16, giving a general description of the type "B" Erie shovel, while at the same time going into fairly complete detail. The bulletin is well illustrated with large clear photographs showing just how the Erie shovel and crane are used on different classes of work. The text is practical and informative, and a copy of this bulletin will be sent free, upon request.

Personals

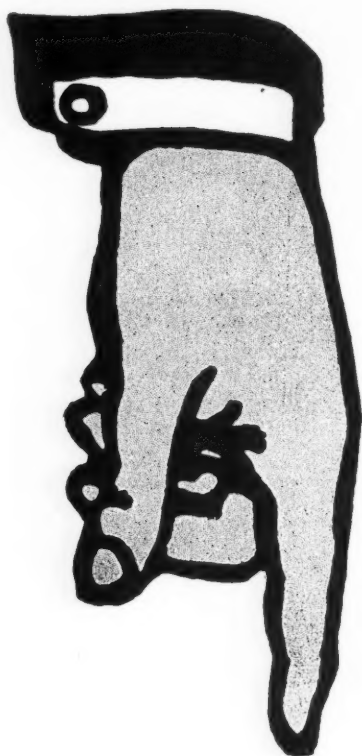
Kirby Thomas, consulting engineer of New York, and Charles L. Nichols, civil engineer of New Haven, have been making a reconnaissance of the Kaolin deposits of New England.

Frederick S. Beard, has been promoted from general sales manager to vice-president and general manager of the Superior Sand & Gravel Co., Detroit, Mich. Mr. Beard succeeds Mr. Chas. H. Brodt, who is no longer connected with the company.

OBITUARY

The Tennessee Agricultural Corporation's wide circle of friends no doubt will receive with keen sorrow news of the passing of W. A. Gray, sales manager of that firm. He was 38 years old, and eighteen years in the rock phosphate industry won him the high esteem of fertilizer men in various sections. His death is not only a loss to the company he has served so ably, but also to the industry to which he gave so much of his efforts to upbuild.

Why Not Read It Regularly



A good habit adds to one's personal enjoyment and often exerts a helpful influence upon one's business success. It is a good habit to regularly read the business periodical devoted to the industry in which one is engaged. You get the news—you keep posted on what is going on; you also obtain fact stories of plant operation, descriptions and illustrations of new methods, processes, equipment, a host of ideas that will help you to operate your own plant more efficiently and profitably. Take this copy of ROCK PRODUCTS—read it through carefully. Note the large amount of practical and helpful information and ideas—then consider how little it costs to have this paper sent to you regularly—26 issues a year. Cheaper to get it than to go without it.



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| <input type="checkbox"/> Sand and Gravel | <input type="checkbox"/> Phosphate |
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170 acre limestone property containing over 25 million tons of rock, analyzing better than 98% pure carbonate of lime.

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257 acres of land, underlaid with fine quality limestone suitable for high-grade hydrated lime, agricultural limestone, flux, etc. Water running through property. Located near Warwick, New York. Close to railroad.

Fuller-Lehigh Company
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Help Wanted

Wanted

A man having had previous experience in the operation of Trappe Rock Ballast Plants, having knowledge of both Jaw and Gyratory Crushers. Address, with references, stating previous experience and salary expected. Plant located in Southeastern Pennsylvania. Address Box 1423

Care Rock Products

WANTED AT ONCE

Foreman for rock quarry near Macon, Georgia. State age, married or single, wages expected. Also experience in handling explosives and machinery. Pulverizing limestone for agricultural purposes. Permanent job for right man. Address

W. F. CULBERT, Marion, Virginia.

We Need Two Copies of the January 17, 1920

issue of ROCK PRODUCTS and will pay 25 cents each for them. First two copies received will be retained and paid for; others will be returned. Send to

ROCK PRODUCTS

542 S. Dearborn St.

Chicago, Ill.

Situations Wanted

T. Nelson Dale

Geologist of the U. S. Geol. Survey and author of U. S. G. S. Bulletins on Slate, Granite and Marble, in view of the termination of his relations to the Survey by the "Retirement Act" on Aug. 20 of this year, will become a Consulting Geologist in problems pertaining to the quarrying of Slate, Granite, Marble, Lime-rock, and to the drilling for water.

Address: The Oaks, Springfield, Mass.

Position Wanted

Superintendent desires engagement. Thoroughly familiar with all details of crushing or sand plants, steam shovel operations and where heavy tonnage is desired. Have good organization of efficient labor available. A 1 references. Address

Box 1430

Care Rock Products

Miscellaneous

American Export Representative, with agents in the principal cities in Cuba and West Indies, wishes to represent Building Material Manufacturer, on strict commission basis. Can furnish references. Address

Box 1427

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If you don't find it advertised in Rock Products we will help you get it

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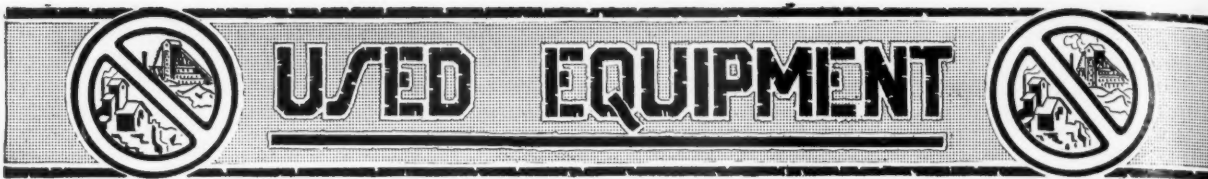
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Repaired Contractors' Equipment

Steam Shovels

Model 60 Marion Shovels, 2½-yard dippers, Nos. 1999, 2059

1—Model 1 Thew, full revolving, on traction wheels.

1—Model O Thew, ½-yard dipper, full revolving, on traction wheels.

We have a large stock of thoroughly repaired Construction Equipment of all kinds ready for immediate shipment.

Locomotives

8—18-ton, 10x16" Porter Dinkeys, 36" gauge.

2—12-ton, 9x14" Porter Dinkeys, 36" gauge.

Clam Shell Buckets

1—1¼-yard Williams Hercules Bucket.

Cars

30—Western Air Dump 12-yard, standard gauge.

40—Western 4-yard, 36" gauge, steel beam.

H. KLEINHANS COMPANY

Union Arcade

Pittsburgh, Pa.

LOCOMOTIVES

- 2—50-ton 18x24" six-wheel switchers.
- 3—24-ton 12x18" six-driver 36" ga. Porters.
- 2—18-ton 10x16" 36" gauge Vulcans.
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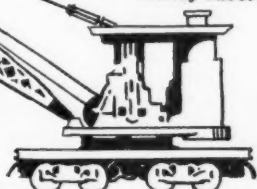
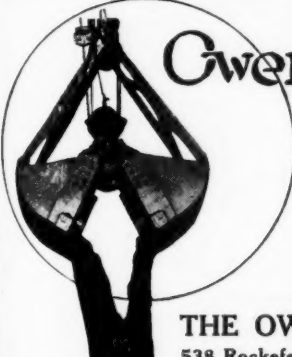
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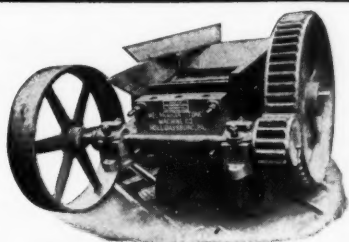



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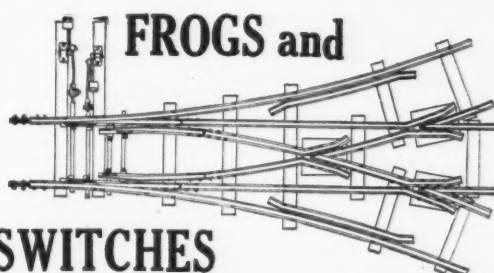
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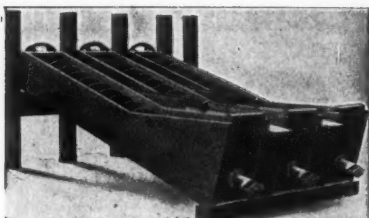


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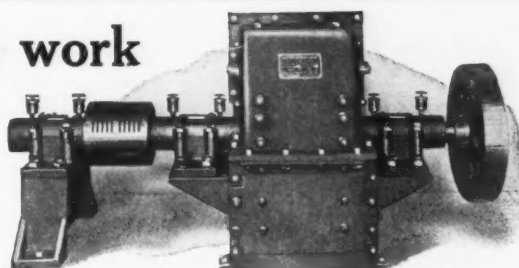
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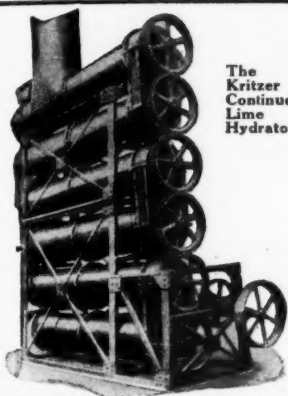
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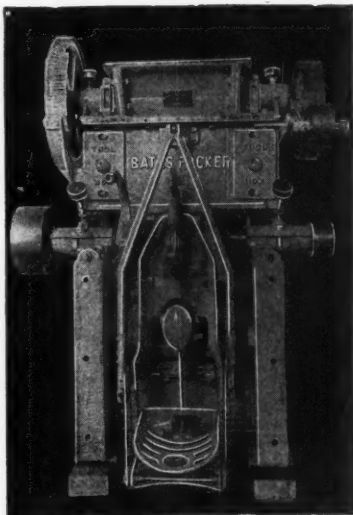
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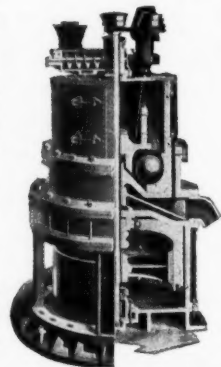
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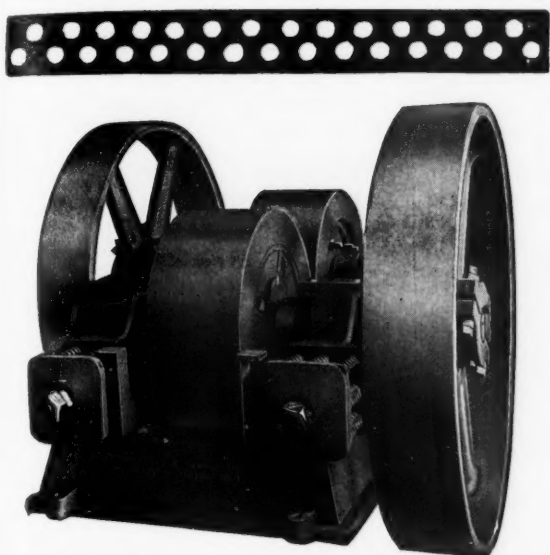
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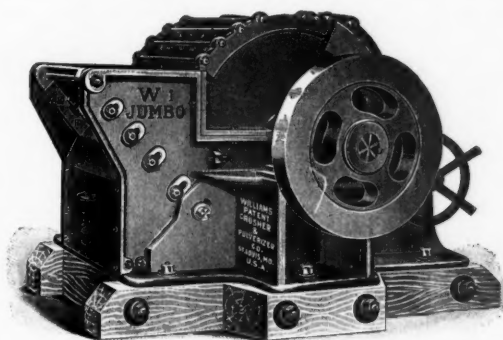




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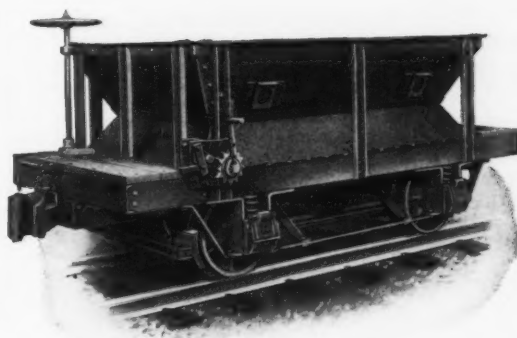
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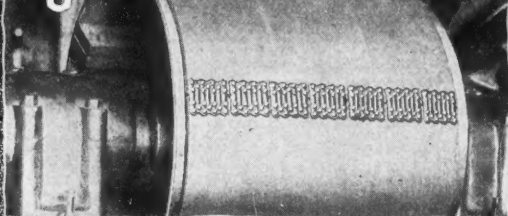
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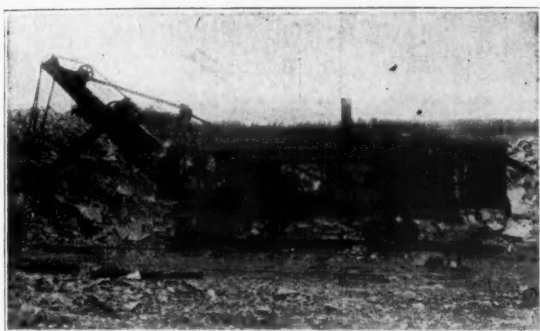
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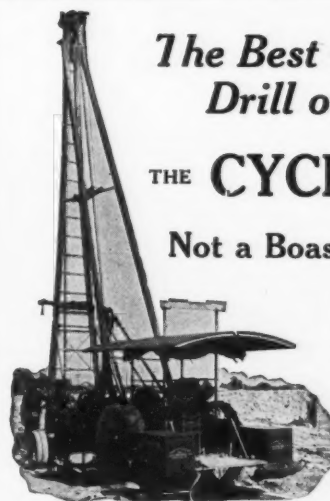
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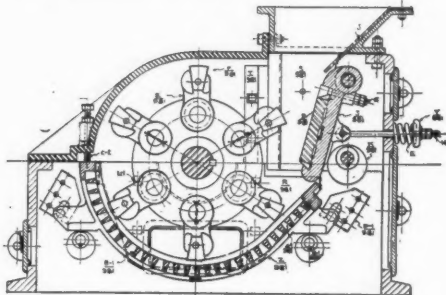
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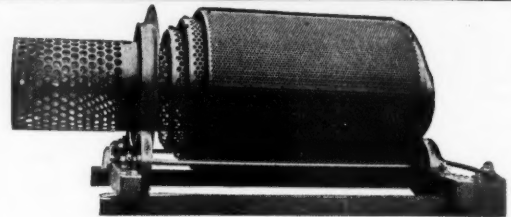
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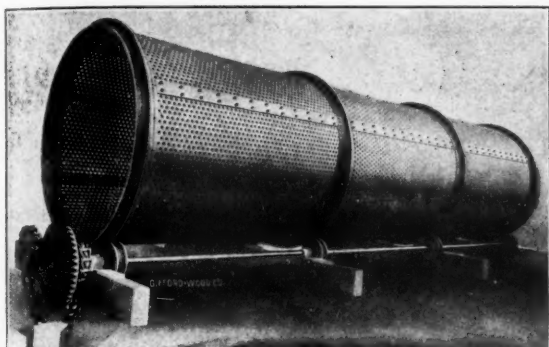
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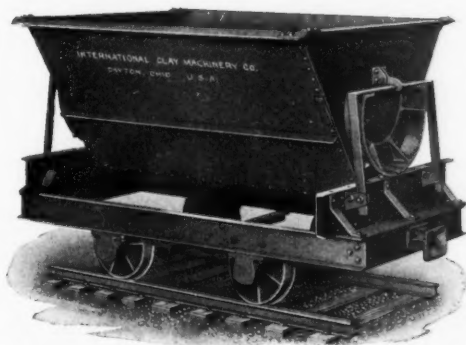
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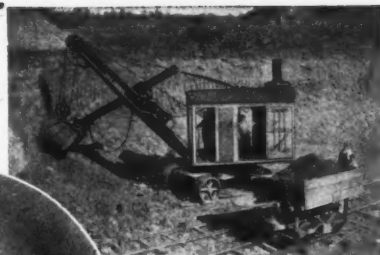
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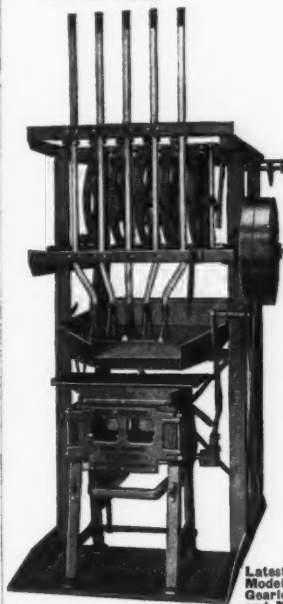
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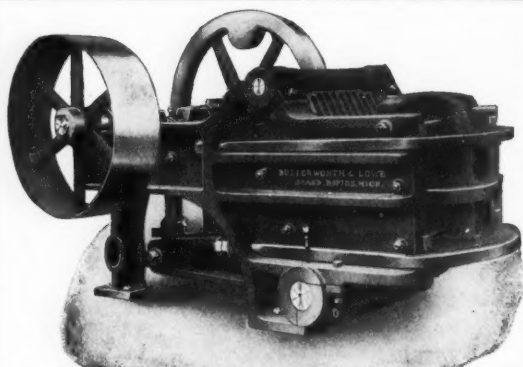
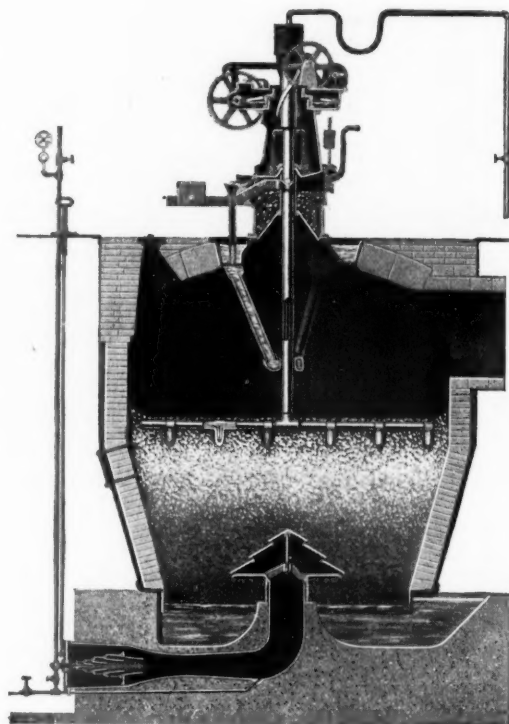
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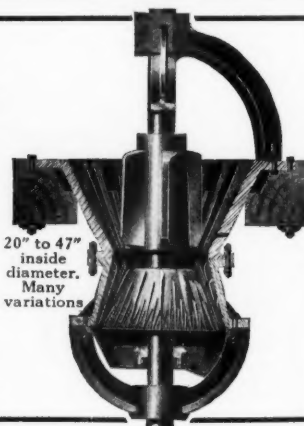
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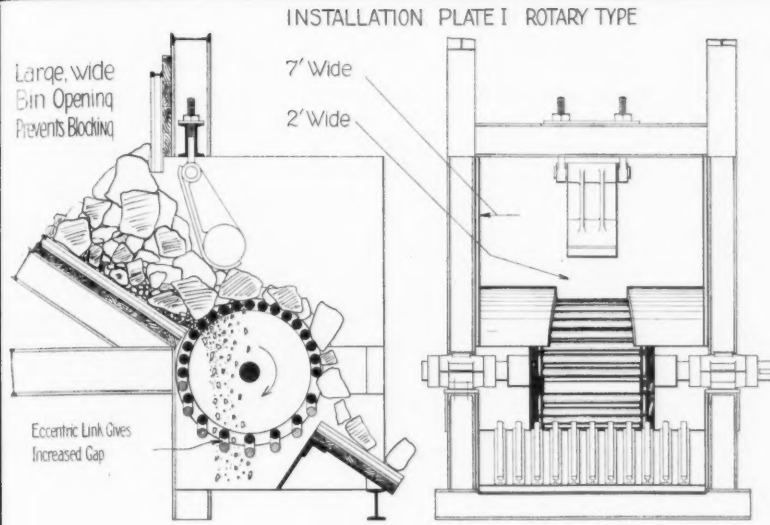
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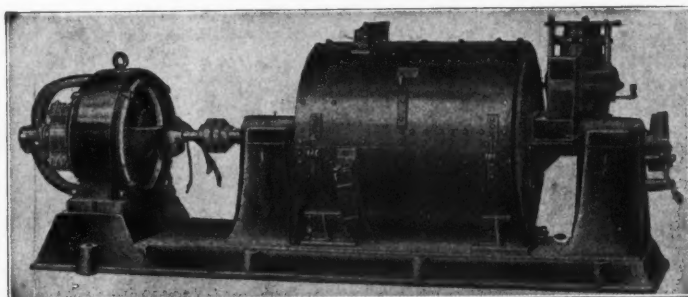
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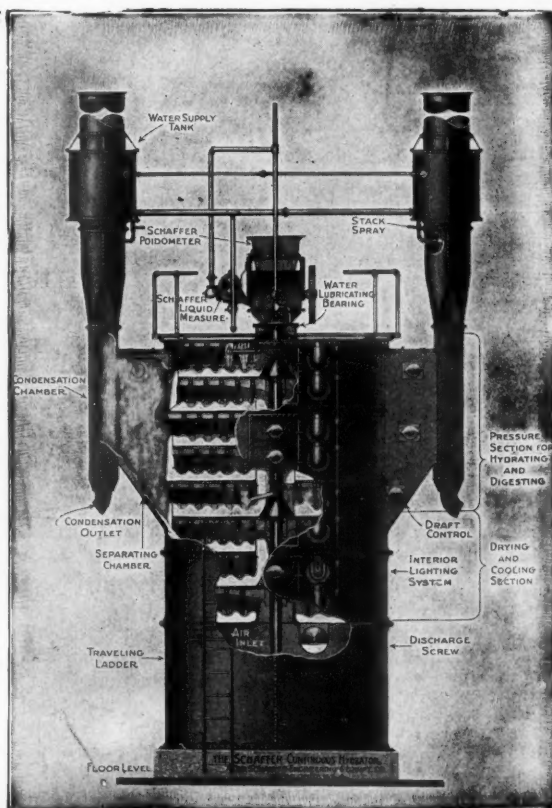
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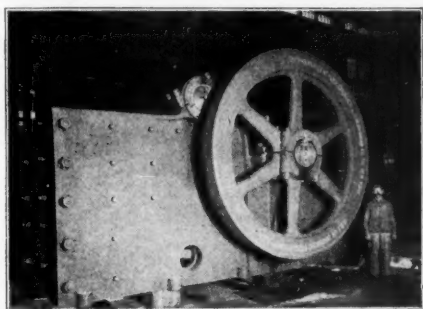


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You want the crusher that you can depend upon all the time. As a chain is no stronger than its weakest link, so a rock crusher is no stronger than its weakest part. There are no weak parts (except the safety toggle) in



BUCHANAN CRUSHERS
ALL-STEEL PATENTED

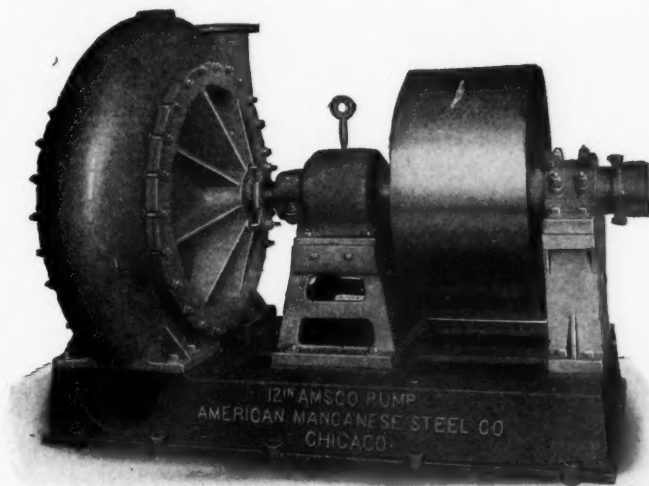
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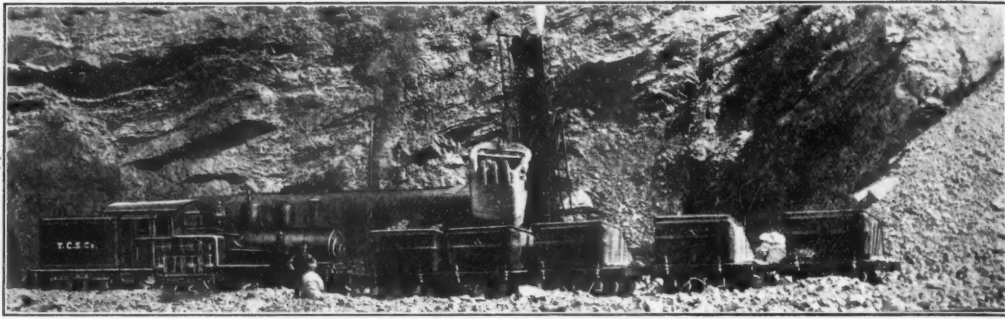
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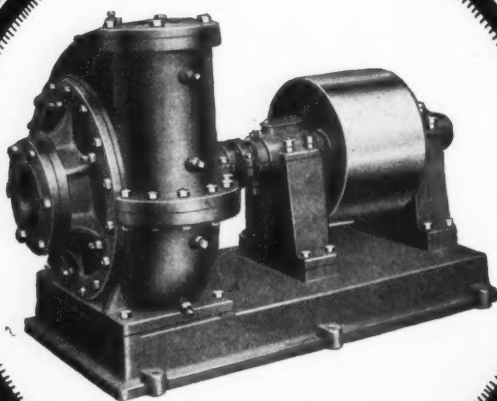
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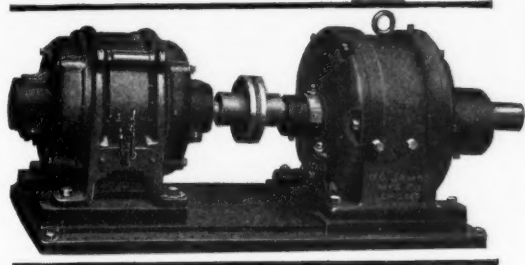
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The Clyde not only produces over 90% of the hydrate of America, but makes the best quality of finishing lime from either high calcium or magnesium.

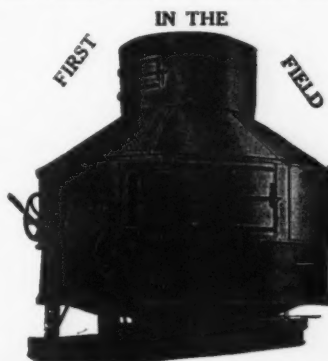
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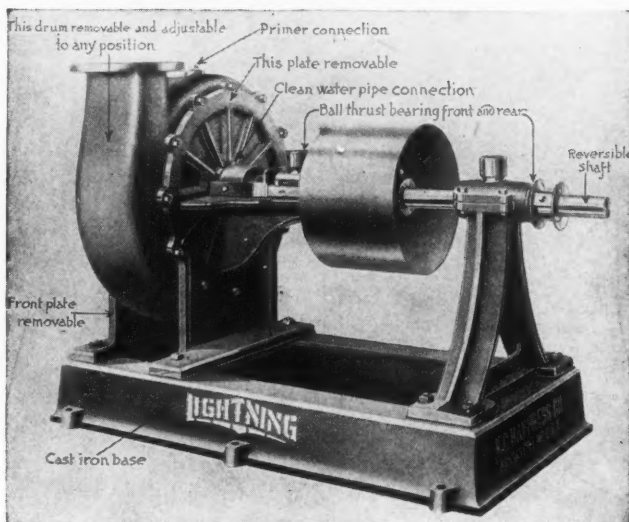
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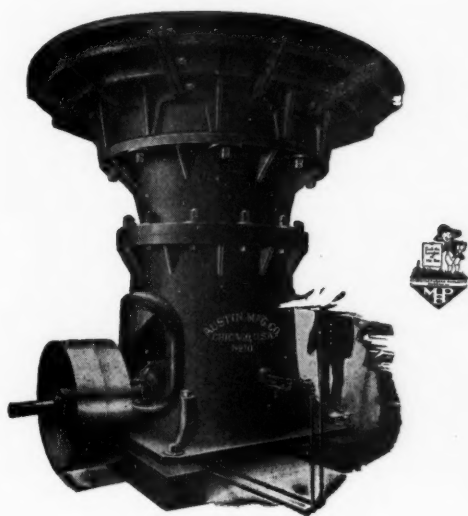
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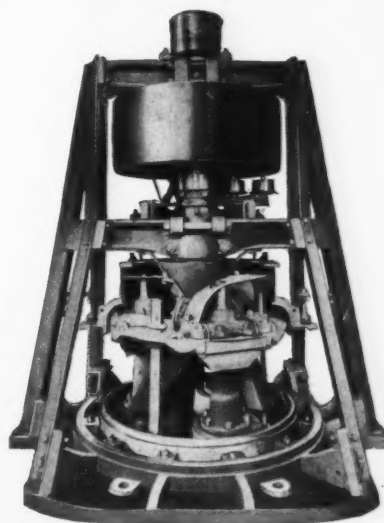
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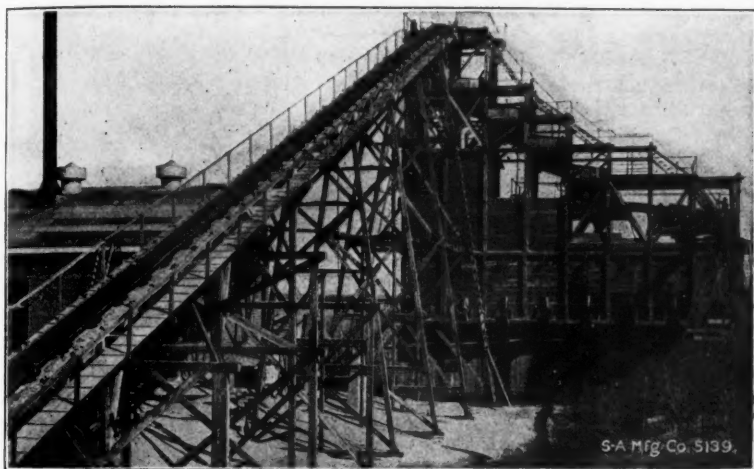
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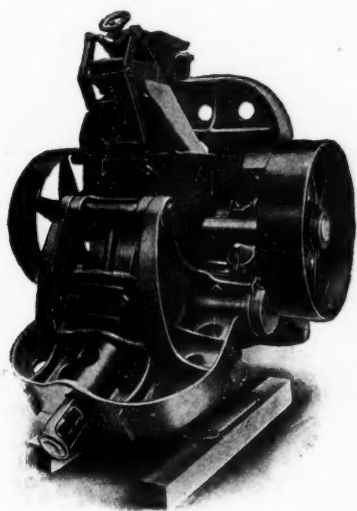
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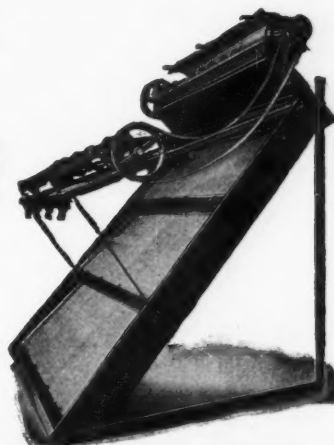
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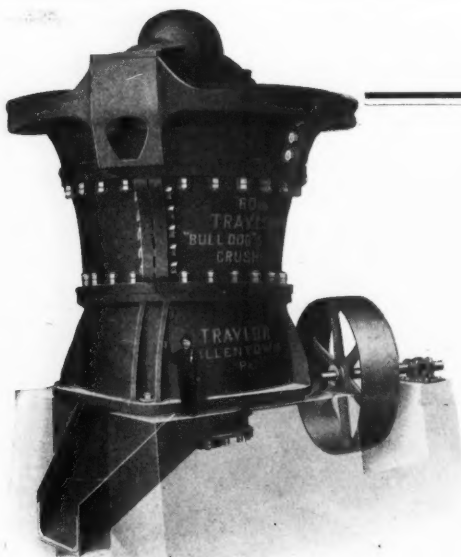
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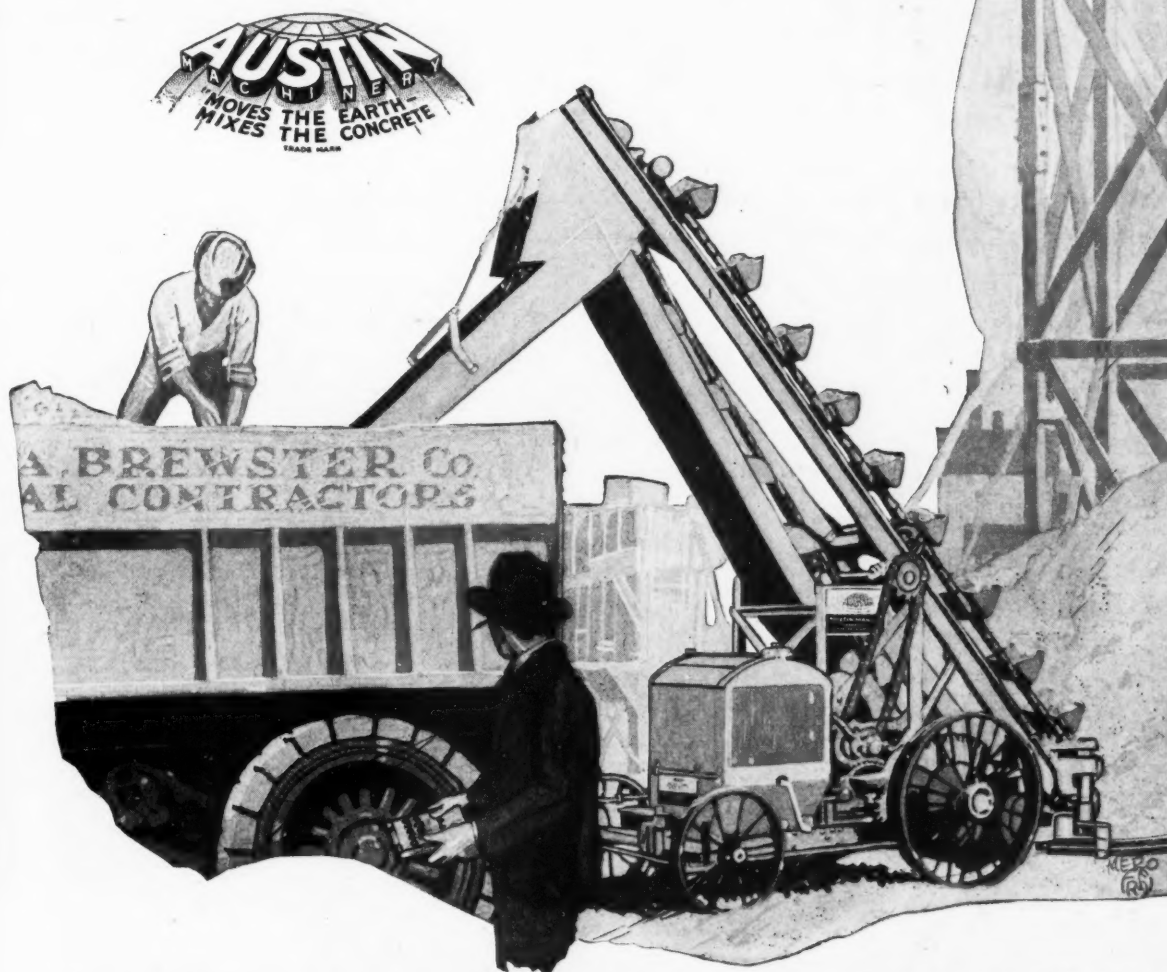
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